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FLORISTICS OF XERIC SANDHILLS IN EAST TEXAS

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ABSTRACT

The floristics and edaphic conditions of two east Texas xeric sandhills are described. This community occurs in central and northwestern Louisiana, east Texas, and southern Arkansas. The sandy soil is nutrient poor and porous. Water and air move rapidly through it causing rapid drying. In presettlement times, sandhills were probably fairly common in the West Gulf Coastal Plain, but because of fire suppression, grazing, agriculture, oil exploration, and agroforestry, this community has been badly damaged and greatly reduced in extent.

KEY WORDS: Sandhills, xeric, floristics, Sabine National Forest, Texas

INTRODUCTION

Like so many plant communities of the West Gulf Coastal Plain, there is little published information on xeric sandhills (synonyms: sandylands, oak-farkleberry sandylands, xeric sandy woodlands, bluejack oak-pine series) (see Diamond *et al.* 1987; Harcombe *et al.* 1993; MacRoberts & MacRoberts 1994, 1995 for previous literature). This community is listed as endangered by both the U.S.D.A. Forest Service and the Texas Organization for Endangered Species because it is potentially vulnerable to extirpation or severe degradation. Most sandhill communities have been destroyed in northwestern Louisiana (MacRoberts & MacRoberts 1995) and the community is imperiled in the state (Teague & Wendt 1994; Louisiana Natural Heritage Program 1988).

Xeric sandhills of the West Gulf Coastal Plain appear to be similar to turkey oak sandhill forests in the East Gulf Coastal Plain except for the absence of several key species such as turkey oak (*Quercus laevis* Walt.) and wiregrass (*Aristida stricta* Michx.) and the presence of several western elements not found in the east (Stout & Marion 1993).

Sandhills occur mainly in Tertiary marine deposits on ridge tops and upper slopes, and on Pleistocene deposits on terraces near streams. The deep sandy soils are of low fertility and, because of their porous nature, water and air move rapidly through them causing rapid drying. Overstory, midstory, and herbaceous vegetation is often sparse, allowing sun to reach the ground, and in some areas, there are no trees. Reflected glare from the sand is often intense. Trees, typically a combination of overstory pines and midstory oaks, are often stunted. Lichens and mosses are usually plentiful on the bare soils, and the soils, where undisturbed, are often cryptogamic.

In order to learn more about this community, we made a study of the vascular flora of two xeric sandhills in San Augustine County on the Sabine National Forest. We had previously studied xeric sandhills in Caddo and Natchitoches parishes, Louisiana (MacRoberts & MacRoberts 1994, 1995) and in this paper we will have occasion to compare the two Texas sites to those.

METHODS

We visited the two sandhills --- San Augustine and FM 1279 ---every two to three weeks between the autumn of 1994 and the autumn of 1995. The two sites are located about 8 km north of San Augustine near the northern border of San Augustine County. Both are on the Sabine National Forest. They are only about 200 meters apart but are on separate drainages.

Both study areas are partly open (10% - 50% cover); dominant trees are *Quercus incana* Bartr., *Q. stellata* Wang., *Pinus palustris* P. Mill., and *P. echinata* P. Mill. Trees are often stunted and openings occur among wooded areas. San Augustine sandhill covers about 4 ha and FM 1279 is about 1 ha. Although the terrain is hilly and thus topographically variable, both sites are about 200 meters above sea level. They occur on a narrow strip of the Carrizo formation, which becomes more extensive to the northwest (Barnes 1967).

The study sites were selected because they appeared to be of high natural quality. Previous work in the area consists of a brief survey designed to locate high quality examples of communities occurring on the National Forests and Grasslands in Texas (Orzell 1990).

We collected and recorded all vascular plants found. We follow Kartesz (1994) in most instances of botanical nomenclature. Voucher specimens of many of the species collected are distributed among ASTC, BRCH, and VDB.

Soil samples were taken from the upper 15 cm of each sandhill and were analyzed by A & L Laboratories, Memphis, Tennessee.

While the specific fire history of these areas is not known, both sites have been regularly burned by the U.S. Forest Service. Half of San Augustine sandhill was prescription burned on June 14, 1995.

Annual precipitation averages about 100 cm and is fairly evenly distributed throughout the year. Humidity is typically high. In summer, temperatures rise to 35° C, which, when combined with short droughts, translates into very hot and dry conditions. Especially under these conditions, the exposed sands become very dry, and reflected light is intense.

RESULTS

The vascular plants found at San Augustine sandhill [S] and FM 1279 sandhill [F] are listed in Table 1. If the species occurs at both sites, no site location is given.

We list the soil characteristics of the Texas sandhills in Table 2

The soil on which this community occurs is acidic loamy fine sand of low fertility and rapid permeability and belongs to the same soil series described previously for Natchitoches and Caddo Parish sandhills (MacRoberts & MacRoberts 1994, 1995). The soils are often cryptogamous, with a brittle lichenous crust.

DISCUSSION

We recorded a total of 117 taxa, representing 96 genera and 46 families, for the two sites. San Augustine sandhill had 108 species, and FM 1279 had 102. Sorensen's Index of Similarity (IS) between the two sandhills was 88.6, meaning that they are the same community. Seven of the species (*Cyperus grayioides, Eriogonum longifolium, Paronychia drummondii, Polygonella polygama, Pediomelum hypogaeum, Selaginella arenicola* subsp. *riddellii*, and *Tetragonotheca ludoviciana*) are on the Texas National Forests and Grasslands rare species list. Asteraceae, Fabaceae, and Poaceae are dominant families, accounting for about 36% of species.

In 1993 and 1994, we studied a small xeric sandhill in Natchitoches Parish, Louisiana (MacRoberts & MacRoberts 1994) for which we recorded 61 taxa. Of these, 54 (89%) occur in the San Augustine and FM 1279 sandhills. We did not compute an IS between this site and those in Texas since species numbers and size are not comparable, but clearly the three sites belong to the same community.

In 1994 and 1995, we studied three sandhills in Caddo Parish, Louisiana (MacRoberts & MacRoberts 1995). Since the North Louisiana sites are comparable in size and species numbers to the Texas sites, we calculated an IS between them: it is 66, indicating that, although there are some major differences, the sandhills in Caddo Parish and East Texas can be considered the same community.

Table 1. Vascular plants at two xeric sandhills in San Augustine County.

ACANTHACEAE -- *Ruellia humilis* Nutt. [S].
AGAVACEAE -- *Yucca louisianensis* Trel. [F].
AMARANTHACEAE -- *Froelichia floridana* (Nutt.) Moq.
ANACARDIACEAE -- *Rhus aromatica* Ait., *R. copallina* L., *Toxicodendron radicans* (L.) O. Ktze.
ANNONACEAE -- *Asimina parviflora* (Michx.) Duval.
APIACEAE -- *Spermolepis echinata* (DC.) Heller [S].
AQUIFOLIACEAE -- *Ilex vomitoria* Ait.
ARISTOLOCHIACEAE -- *Aristolochia reticulata* Jacq.
ASCLEPIADACEAE -- *Asclepias tuberosa* L., *Matelea cynanchoides* (Engelm.) Wood.
ASTERACEAE -- *Ambrosia artemisiifolia* L. [F], *Croptilon divaricatum* (Nutt.) Raf., *Gnaphalium obtusifolium* L., *G. purpureum* L., *Helianthus debilis* Nutt. subsp. *cucumerfolius* (Torrey & A. Gray) Heiser [S], *Heterotheca pilosa* (Nutt.) Shinners, *Hieracium gronovii* L., *Hymenopappus artemisiaefolius* DC., *Liatris elegans* (Walt.) Michx., *Krigia virginica* (L.) Willd., *Pityopsis graminifolia* (Michx.) Nutt., *Solidago nitida* Torrey & A. Gray, *S. odora* Ait. [S], *Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray [F], *Thelesperma filifolium* (Hook.) A. Gray [S], *Vernonia* sp. [F], *V. texana* (A. Gray) Small.
BORAGINACEAE -- *Lithospermum caroliniense* (J.F. Gmel.) MacM.
CACTACEAE -- *Opuntia humifusa* (Raf.) Raf.
CAMPANULACEAE -- *Triodanis perfoliata* (L.) Nieuwl. [S].
CAPPARIDACEAE -- *Polanisia erosa* (Nutt.) Iltis [F].
CARYOPHYLLACEAE -- *Paronychia drummondii* Torrey & A. Gray.
CISTACEAE -- *Helianthemum georgianum* Chapm., *Lechea mucronata* Raf.
CLUSIACEAE -- *Hypericum gentianoides* (L.) B.S.P., *H. hypericoides* (L.) Crantz.
COMMELINACEAE -- *Commelina erecta* L., *Tradescantia reverchonii* Bush.
CONVOLVULACEAE -- *Ipomoea pandurata* (L.) Mey., *Stylisma pickeringii* (Torrey *ex* Curtis) A. Gray.
CUPRESSACEAE -- *Juniperus virginiana* L. [S].
CYPERACEAE -- *Bulbostylis ciliatifolia* (Ell.) Fern., *Cyperus grayioides* Mohlenbrock, *C. retrofractus* (L.) Torr., *C. retroflexus* Buckl., *Rhynchospora grayi* Kunth, *Scleria triglomerata* Michx.
DENNSTAEDTIACEAE -- *Pteridium aquilinum* (L.) Kuhn.
ERICACEAE -- *Monotropa uniflora* L., *Vaccinium arboreum* Marsh., *V. stamineum* L.
EUPHORBIACEAE -- *Chamaesyce cordifolia* (Ell.) Small, *Cnidosculus texanus* (Muell.-Arg.) Small, *Crotonopsis linearis* Michx., *Stillingia sylvatica* L. [S], *Tragia urens* L., *T. urticifolia* Michx.
FABACEAE -- *Baptisia nuttalliana* Small, *Centrosema virginianum* (L.) Benth., *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby [F], *Desmodium* sp., *Lespedeza* sp., *Pediomelum hypogaeum* (Nutt. *ex* Torrey & A. Gray) Rydb. var. *subulatum* (Bush) J. Grimes, *Rhynchosia latifolia* Nutt. *ex* Torrey & A. Gray, *Stylosanthes biflora* (L.) B.S.P., *Tephrosia virginiana* (L.) Pers.
FAGACEAE -- *Quercus incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang., *Castanea alnifolia* Nutt. [F].
IRIDACEAE -- *Alophia drummondii* (Graham) R.C. Foster.

Table 1. (cont.).

JUGLANDACEAE -- *Carya* sp.
LAMIACEAE -- *Monarda punctata* L. [S], *Scutellaria cardiophylla* Engelm. & A. Gray, *Trichostema dichotomum* L.
LAURACEAE -- *Sassafras albidum* (Nutt.) Nees.
LILIACEAE -- *Smilax* sp.
LOGANIACEAE -- *Gelsemium sempervirens* (L.) St. Hil.
OLEACEAE -- *Chionanthus virginicus* L. [S].
ONAGRACEAE -- *Oenothera biennis* L. [S].
OXALIDACEAE -- *Oxalis stricta* L.
PINACEAE -- *Pinus echinata* P. Mill., *P. palustris* P. Mill., *P. taeda* L.
POACEAE -- *Andropogon ternarius* Michx., *Andropogon virginicus* L. [S], *Aristida desmantha* Trin. & Rupr., *Aristida lanosa* Ell., *Aristida purpurascens* Poir., *Bouteloua hirsuta* Lag. [S], *Dichanthelium oligosanthes* (Schult.) Gould, *D. villosissimum* (Nash) Freckman, *D. sphaerocarpon* (Ell.) Gould, *Eragrostis spectabilis* (Pursh) Steud., *Gymnopogon ambiguus* (Michx.) B.S.P., *Paspalum* spp., *Schizachyrium scoparium* (Michx.) Nash, *Sorghastrum elliottii* (Mohr) Nash [F], *Sporobolus asper* (Michx.) Kunth var. *macer* (Trin.) Shinners [S], *Sporobolus junceus* (Michx.) Kunth [S].
POLYGALACEAE -- *Polygala polygama* Walt.
POLYGONACEAE -- *Eriogonum longifolium* Nutt., *Polygonella americana* (Fisch. & Mey.) Small, *P. polygama* (Vent.) Engelm. & A. Gray.
RUBIACEAE -- *Diodia teres* Walt.
SAPOTACEAE -- *Bumelia lanuginosa* (Michx.) Pers.
SCROPHULARIACEAE -- *Aureolaria pectinata* (Nutt.) Penn., *Linaria canadensis* (L.) Dum.-Cours.
SELAGINELLACEAE -- *Selaginella arenicola* Underw. subsp. *riddellii* (Van Eselt.) Tryon.
SOLANACEAE -- *Physalis heterophylla* Nees., *P. mollis* Nutt.
VERBENACEAE -- *Glandularia canadensis* (L.) Nutt. [F].
VITACEAE -- *Ampelopsis arborea* (L.) Koehne, *Vitis aestivalis* Michx., *V. rotundifolia* Michx.

Table 2. Soil characteristics of two xeric sandhills in San Augustine County.

		Exchangeable Ions (ppm)				
Sample	pH	P	K	Ca	Mg	OM%
FM 1279	5.7	8	26	70	12	2.0
San Augustine	5.2	7	27	70	11	1.3

Orzell (1990), in his survey of the plant communities of the Texas National Forests and Grasslands, found the San Augustine sandhills to be of high quality. We concur with this assessment. The sandhills we studied in Caddo Parish, Louisiana were decidedly inferior to the Texas sites and contained many exotics, which accounts for the relatively low IS between them and the Texas sites. The San Augustine sandhills compare favorably to some xeric sandhills we have examined in Natchitoches Parish on the Kisatchie National Forest (MacRoberts & MacRoberts 1994). However, neither of the Texas sites is without damage. A tramway, power line right-of-way, an old dump, roads, and plowed firelines mar the San Augustine site; while FM 1279 is free of these disturbances, it is fire suppressed.

The entire area was cut prior to National Forest acquisition in 1936. Part of San Augustine sandhill was planted with longleaf pine in the early 1940's, but this seems to have failed and the same area was replanted in the late 1940's, again with longleaf pine. The rest of the longleaf appears to have seeded in naturally.

During of the course of this study, we briefly surveyed several other xeric sandhills in East Texas, notably in northwest Jasper, southeast Angelina, and southern Sabine counties on the Angelina and Sabine National Forests. These often grade imperceptibly into upland longleaf pine savannah, but many species fidel to xeric sites pinpoint the more xeric extremes. Notably rich in such fidels are the sandhills running across the southern part of the Angelina National Forest. Some of these rank in quality (and thus rarity) with San Augustine and FM 1279 and should be protected.

ACKNOWLEDGMENTS

Robert E. Evans, Ecologist, National Forests and Grasslands in Texas, and Suzanne Walker, Botanist, Sabine National Forest, were instrumental in making this study possible. The study was supported in part by a Challenge Cost-Share Agreement with the National Forests and Grasslands in Texas. Robert E. Evans and D.T. MacRoberts made helpful comments on an earlier version of this paper.

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MORFOLOGIA DE LOS GRANOS DE POLEN DE LA FAMILIA BIGNONIACEAE DE LA ESTACION DE BIOLOGIA CHAMELA, JALISCO, MEXICO

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RESUMEN

Se estudia e ilustra al microscopio de luz la morfología de los granos de polen de diez géneros y diesiseis especies de la familia Bignoniaceae de la Estación de Biología Chamela, Jalisco perteneciente a la Universidad Autónoma de México. Comprende los siguientes taxa: *Adenocalymma inundatum* Mart. *ex* DC., *Arrabidaea corallina* (Jacq.) Sandw., *Arrabidaea patellifera* (Schlecht.) Sandw., *Arrabidaea viscida* (Donn.-Sm.) A. Gentry, *Astianthus viminalis* (H.B.K.) Baill., *Clytostoma binatum* (Thunb.) Sandw., *Crescentia alata* H.B.K., *Cydista aequinoctialis* (L.) Miers, *Cydista diversifolia* (H.B.K.) Miers, *Melloa quadrivalvis* (Jacq.) A. Gentry, *Pithecoctenium crucigerum* (L.) A. Gentry, *Tabebuia chrysantha* (Jacq.) Nichols., *Tabebuia donnell-smithii* Rose, *Tabebuia impetiginosa* (Mart.) Standl., *Tabebuia rosea* (Bertol.) DC., y *Xylophragma seemannianum* (Ktze.) Sandw. Con los datos aquí obtenidos fue posible elaborar una clave palinológica para diferenciar la mayoría de los géneros y las especies.

Se discute la posición taxonómica de algunos taxa y se dan algunas interpretaciones tomando en consideración la morfología del polen.

PALABRAS CLAVE: palinología, Bignoniaceae, Chamela, Jalisco, México

ABSTRACT

Pollen grain morphology of ten genera and sixteen species of Bignoniaceae from Estación de Biología Chamela, Jalisco belonging to the Universidad Nacional Autónoma de México are described and illustrated using the light

microscope, the taxa described are: *Adenocalymma inundatum* Mart. *ex* DC., *Arrabidaea corallina* (Jacq.) Sandw., *Arrabidaea patellifera* (Schlecht.) Sandw., *Arrabidaea viscida* (Donn.-Sm.) A. Gentry, *Astianthus viminalis* (H.B.K.) Baill., *Clytostoma binatum* (Thunb.) Sandw., *Crescentia alata* H.B.K., *Cydista aequinoctialis* (L.) Miers, *Cydista diversifolia* (H.B.K.) Miers, *Melloa quadrivalvis* (Jacq.) A. Gentry, *Pithecoctenium crucigerum* (L.) A. Gentry, *Tabebuia chrysantha* (Jacq.) Nichols, *Tabebuia donnell-smithii* Rose, *Tabebuia impetiginosa* (Mart.) Standl., *Tabebuia rosea* (Bertol) DC., and *Xylophragma seemannianum* (Ktze.) Sandw. A key for separation of most genera and species by pollen grain characteristics is included.

Taxonomic position of some taxa is discussed taking into account some interpretations and discrepancies based on pollen grains studied.

KEY WORDS: palinology, Bignoniaceae, Chamela, Jalisco, México

INTRODUCCION

El presente trabajo forma parte de los estudios sobre la flora polínica de la Estación de Biología Chamela, Jalisco, México, que Palacios-Chávez *et al.* (1986) vienen realizando.

La familia Bignoniaceae comprende 110 géneros y 750 especies (Lawrence 1951), distribuídas en las zonas tropicales de casi todo el mundo, la mayoría son árboles, arbustos o lianas, rara vez hierbas. En la Estación de Biología Chamela, Jalisco, México prosperan diez géneros y diesiseis especies (Lott 1985).

ANTECEDENTES

Entre los estudios palinológicos de esta familia se tienen los de Erdtman (1966), quien describe brevemente 25 especies correspondientes a veinte géneros. Palacios-Chávez (1966) describe e ilustra cuatro géneros y cinco especies del estado de Morelos. Mitra (1968) estudia 32 géneros y distingue doce tipos polínicos basándose en las aberturas, concluye que la familia debe ser polifilética por la gran diversidad palinológica y la presencia de tipos polínicos primitivos y avanzados y Heusser (1971) estudia cuatro géneros y cuatro especies para Chile, con breves descripciones y fotomicrografías. Huang (1972) describe brevemente e ilustra cuatro géneros y cuatro especies de Taiwan. Suryakanta (1973) estudia 47 géneros y 84 especies y menciona que la evolución de las aberturas del polen proviene de un colpo espiraperturado, además indica que las Bignoniaceae que crecen como lianas presentan más variaciones en el polen que las arbustivas o árboles y que los géneros herbáceos se caracterizan por tener un gran número de aberturas. Buurman (1977) estudia las especies tricolporadas en 83 géneros de la familia Bignoniaceae. Markgraf & D'Antoni (1978) observan e ilustran el de tres géneros y tres especies de la Argentina. Gentry & Tomb (1979) estudian el polen de 63 taxa al microscopio electrónico de barrido y mencionan 26

tipos polínicos para la familia, relacionan la morfología del polen con la taxonomía de la familia y las líneas evolutivas que han propuesto otros autores. Fernandes-Silvestre & Melhem (1989) describen e ilustran al microscopio de luz y de barrido diesinueve géneros del parque estatal das Fontes do Opiranga en Sao Paulo, Brasil. Roubick & Moreno (1991) describen e ilustran veinte géneros y 31 especies de la Isla Barro Colorado, Panamá. Palacios-Chávez *et al.* (1991) para la flora de la reserva de Sian Ka'an, Quintana Roo, México describen e ilustran seis géneros y ocho especies. Bove (1993) estudia al microscopio de luz y de barrido la morfología de diesinueve géneros y 33 especies de Bignoniaceae nativas del sur de Brasil.

METODOLOGIA

Las muestras de polen fueron tomadas principalmente de los ejemplares de herbario depositados en el museo de la Estación de Biología Chamela, Jalisco y del Herbario del Instituto de Biología de la Universidad Nacional Autónoma de México (MEXU). Cuando no se pudo tomar polen de esa colección, por carecer de flores, las muestras polínicas se obtuvieron de ejemplares colectados en diversos lugares de la República Mexicana previa corroboración de la identificación de los mismos como fue el caso de *Arrabidaea patellifera*, cuyo polen se tomo del ejemplar depositado en el herbario de la Escuela Nacional de Ciencias Biológicas (ENCB).

El polen fue tratado con la técnica de acetólisis de Erdtman (1943), para observación al microscopio de luz, y las preparaciones se encuentran depositadas en la palinoteca de la Escuela Nacional de Ciencias Biológicas del Instituto Politécnico Nacional.

La secuencia que se sigue en las descripciones palinológicas es la de Hyde, H.A. & K.F. Adams (1958).

En las fotomicrografías se incluye una escala que representa 10 micras.

DESCRIPCION DE LOS GRANOS DE POLEN

Adenocalymma inundatum Mart. *ex* DC., Estación de Biología Chamela, Jalisco, *S.H. Bullock 1202* (MEXU). Lámina I, Figuras 1 a 3.

Polen inaperturado, intectado, esferoidal de 48(55)65 × 48(59)56 μ de diámetro. Exina de 1.6 μ de grosor, con la nexina y sexina de igual espesor, superficialmente equinada. Espinas romas y puntiagudas de 2(3)4 μ de altura × 1(2)3 μ de base.

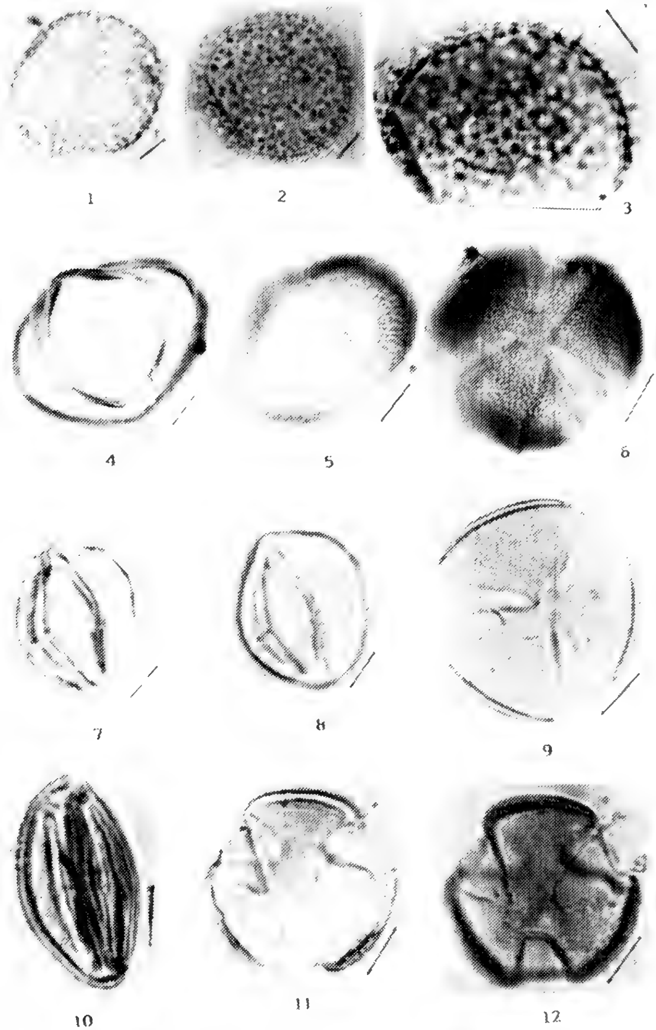

Lámina I. *Adenocalymma inundatum*: 1.- Exina a seco fuerte; 2.- Vista superficial a seco fuerte; 3.- Detalle de la ornamentación, inmerción. *Arrabidaea corallina*: 4.- Vista ecuatorial mostrando colpos; 5.- Vista ecuatorial mostrando colpos y ornamentación; 6.- Vista polar, ornamentación. *Arrabidaea patellifera*: 7.- Vista ecuatorial, exina, y colpos; 8.- Vista ecuatorial, detalle de los colpos; 9.- Vista polar, ornamentación. *Arrabidaea viscida*: 10.- Vista ecuatorial, mostrando los colpos; 11.- Vista polar, exina; 12.- Vista polar, ornamentación.

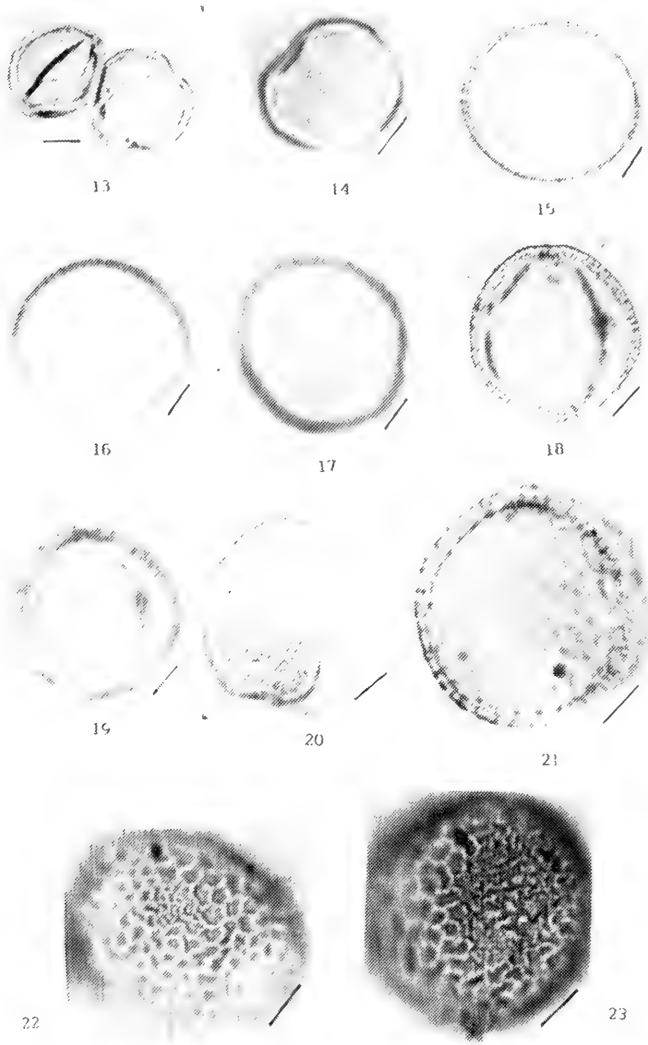

Lámina II. *Astianthus viminalis*: 13.- Vistas polar y ecuatorial, mostrando los colpos, y exina; 14.- Vista polar, ornamentación. *Clytostoma binatum*: 15.- Grosor de la exina; 16.- Detalle de la ornamentación y exina; 17.- Detalle de la ornamentación. *Crescentia alata*: 18.- Vista ecuatorial, exina y colpos; 19.- Vista ecuatorial, ornamentación: 20.- Vista polar, ornamentación. *Cydista aequinoctialis*: 21.- Grosor de la exina; 22 y 23.- Detalle de la ornamentación.

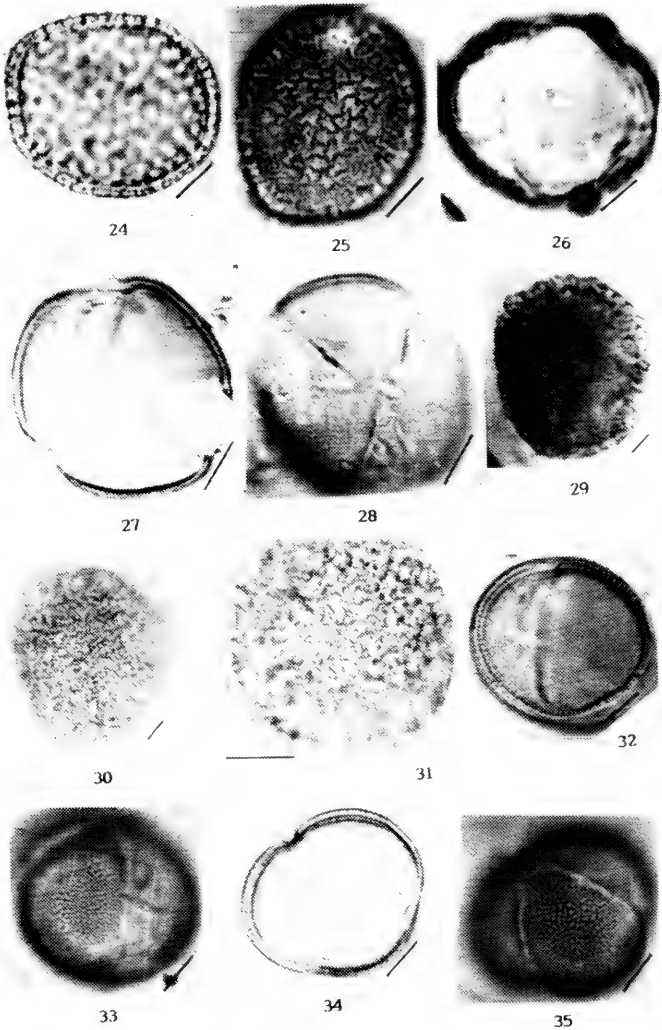

Lámina III. *Cydista diversifolia*: 24.- Grosor de la exina; 25.- Detalle de la ornamentación. *Melloa quadrivalvis*: 26.- Vista ecuatorial, colpos; 27.- Vista polar, exina; 28.- Vista polar, ornamentación. *Pithecoctenium crucigerum*: 29.- Exina a seco fuerte; 30.- Ornamentación a seco fuerte; 31.- Detalle de la exina y ornamentación a inmerción. *Tabebuia chrysantha*: 32.- Vista ecuatorial mostrando la exina y colpos; 33.- Vista ecuatorial mostrando ornamentación y colpos; 34.- Vista polar, exina; 35.- Vista polar, ornamentación.

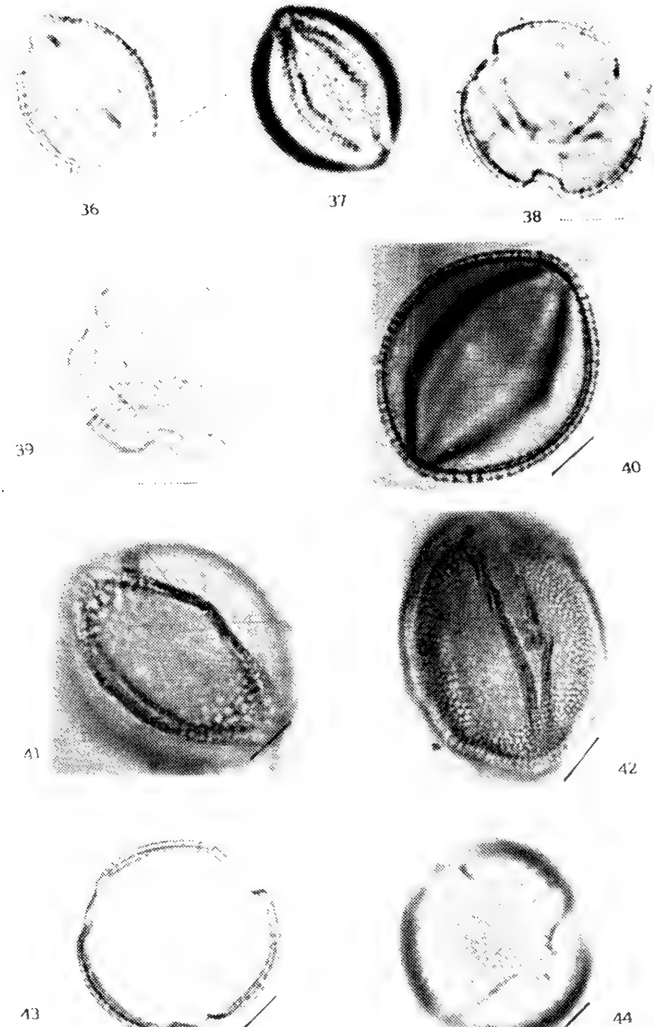

Lámina IV. *Tabebuia donnell-smithii*: 36.- Vista ecuatorial, mostrando exina y colpos; 37.- Vista ecuatorial, ornamentación, y colpos; 38.- Vista polar, exina; 39.- Vista polar, ornamentación. *Tabebuia impetiginosa:* 40.- Vista ecuatorial, exina; 41.- Vista ecuatorial, colpos; 42.- Vista ecuatorial, ornamentación; 43.- Vista polar, exina; 44.- Vista polar, ornamentación.

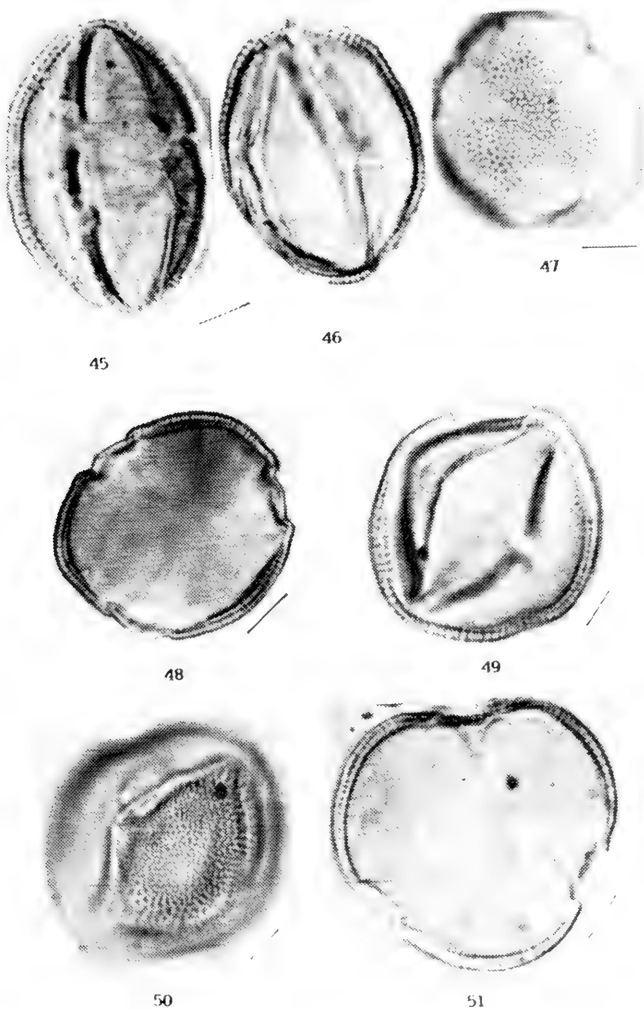

Lámina V. *Tabebuia rosea*: 45.- Vista ecuatorial, colpos, y exina; 46.- Vista ecuatorial, detalle de la exina; 47.- Vista polar, ornamentación; 48.- Vista polar, exina. *Xylophragma seemannianum*: 49.- Vista ecuatorial, exina, y colpos; 50.- Vista ecuatorial, ornamentación, y colpos; 51. Vista polar, exina.

Arrabidaea corallina (Jacq.) Sandw., 5 Km al W de Rizo de Oro, sobrela carretera 190, Mpio. Cintalapa de Figueroa, Chiapas, *D.E. Breedlove 24639* (MEXU). Lámina I, Figuras 4 a 6.

Polen tricolporado, semitectado, esferoidal de 34(38)42 × 32(35)38 μ. P/E= 1.09. Vista polar circular de 33(39)41 μ de diámetro. Exina de 2.4 μ de grosor, con la sexina y la nexina de igual espesor, ligeramente reticulada. Colpos cubiertos con membranas lisas y con terminaciones agudas. Colpos transversales de 4(7)9 μ de largo × 1(3)5 μ de ancho. Indice del área polar 0.16, pequeña.

Arrabidaea patellifera (Schlecht.) Sandw., Al norte de Valle Nacional, Mpio. San José Chiltepec, Oaxaca, *S.D. Koch & P.A. Fryxell 78194* (ENCB). Lámina I, Figuras 7 a 9.

Polen tricolporado, tectado, subprolato, de 39(41)45 × 28(32)36 μ. P/E= 1.28. Vista polar circular de 39(42)47 μ de diámetro. Exina de 2 μ de grosor, con la sexina mucho más gruesa que la nexina, superficie puntitegilada. Colpos cubiertos con membranas lisas. Colpos transversales de 9(12)16 μ de largo × 2(3)4 μ de ancho. Indice del área polar 0.25, media.

Arrabidaea viscida (Donn.-Sm.) A. Gentry, Estación de Biología Chamela, Jalisco, *A. Solís 726* (MEXU). Lámina I, Figuras 10 a 12.

Polen tricolpado, tectado, prolato de 29(37)40 × 24(27)32 μ. P/E= 1.37. Vista polar circular de 28(33)39 μ de diámetro. Exina de 1.6 μ de grosor, con la sexina y la nexina de igual espesor, superficialmente escabrosa. Margocolpados, colpos cubiertos con membranas lisas, margo de 1.6 μ de ancho. Indice del área polar 0.25, pequeña.

Astianthus viminalis (H.B.K.) Baill., Estación de Biología Chamela, Jalisco, *E. Lott 1045* (MEXU). Lámina II, Figuras 13 y 14.

Polen tricolpado, tectado, psilado, subprolato de 25(30)35 × 22(24)27 μ. P/E= 1.25. Vista polar circular de 25.0(28.0)30.4 μ de diámetro. Exina de 1.6 μ de grosor, sexina mucho más gruesa que la nexina, superficialmente psilada. Colpos cubiertos con membranas lisas, bordeados por un margo de 1 μ de ancho. Indice del área polar 0.14, pequeña.

Clytostoma binatum (Thunb.) Sandw., Estación de Biología Chamela, Jalisco, *E. Lott 1114* (MEXU). Lámina II, Figuras 15 a 17.

Polen inaperturado, semitectado, esferoidal de 45(46)49 × 41(43)44 μ. Exina de 2.4 μ de grosor, sexina y nexina de igual espesor, superficialmente perreticulada, con lúmenes menores de 1 μ de diámetro.

Crescentia alata H.B.K., Estación de Biología Chamela, Jalisco, *S.H. Bullock 973* (MEXU). Lámina II, Figuras 18 a 20.

Polen tricolpado, semitectado, esferoidal de 45(49)54 × 42(44)46 μ. P/E= 1.11. Vista polar circular de 40(46)50 μ de diámetro. Exina de 2.4 μ de grosor, sexina ligeramente de mayor espesor que la nexina, superficialmente perreticulada con luenes de aproximadamente 1 μ de diámetro. Colpos cubiertos con membranas lisas. Indice del área polar 0.17, pequeña.

Cydista aequinoctialis (L.) Miers, Estación de Biología Chamela, Jalisco, *E. Lott 456* (MEXU). Lámina II, Figuras 21 a 23.

Polen inaperturado, esferoidal, semitectado, de 40.0(43.5)48.0 × 40(46)50 μ. Exina de 3.3 μ de grosor, con la sexina y la nexina de igual espesor, superficialmente perreticulada con lúmenes de 2 a 3 μ de diámetro.

Cydista diversifolia (H.B.K.) Miers, Estación de Biología Chamela, Jalisco, *A. Solís 1678* (MEXU). Lámina III, Figuras 24 y 25.

Polen inaperturado, semitectado, esferoidal de 35.5(39.6)42.3 × 32.9(37.6)42.3 μ. Exina de 2.5 μ de grosor, sexina y nexina de igual espesor, superficialmente perreticulada con lúmenes de 2 a 3 μ de diámetro.

Melloa quadrivalvis (Jacq.) A. Gentry, Estación de Biología Chamela, Jalisco *L.A. Pérez 1768* (MEXU). Lámina III, Figuras 26 a 28.

Polen tricolpado, tectado, esferoidal, de 38.0(40.1)43.0 × 33.0(38.6)41.5 μ. P/E= 1.03. Vista polar circular de 38(41)43 μ de diámetro. Exina de 1.5 μ de espesor, sexina y nexina de igual grosor, escabrosa. Indice del área polar 0.16, pequeña.

Pithecoctenium crucigerum (L.) A. Gentry, Estación de Biología Chamela, Jalisco, *A. Solís 3704* (MEXU). Lámina III, Figuras 29 a 31.

Polen inaperturado, semitectado, esferoidal de 62.6(69.7)77.0 × 57.5(65.5)71.0 µm. Exina de 6.7 µ de grosor, sexina mucho más gruesa que la nexina, perreticulada, con lúmenes de 3 a 5 µ de diámetro.

Tabebuia chrysantha (Jacq.) Nichols., Estación de Biología Chamela, Jalisco, *S.H. Bullock 1274* (MEXU). Lámina III, Figuras 32 a 35.

Polen tricolporado, tectado, esferoidal de 33.0(35.6)38.0 × 29.6(30.8)33.8 µ. P/E= 1.15. Vista polar circular de 28.5(31.7)34.6 µ de diámetro. Exina de 1.5 µ de espesor, sexina y nexina de igual grosor, levemente reticulada, con lúmenes menores de 1 µ de diámetro. Colpos cubiertos con membranas lisas. Colpos transversales de 4(5)6 µ de largo × 1.5(2.0)2.5 µ de ancho. Indice del área polar 0.38, media.

Tabebuia donnell-smithii Rose, Estación de Biología Chamela, Jalisco, *S.H. Bullock 1309* (MEXU). Lámina IV, Figuras 36 a 39.

Polen tricolpado a veces tricolporoidado, tectado, subprolato de 26.0(31.8)32.4 × 23.6(27.0)29.6 µ. P/E= 1.17. Vista polar circular de 27.0(29.5)31.3 µ de diámetro. Exina de 2.5 µ de grosor, sexina dos veces más gruesa que la nexina, reticulada con lúmenes de aproximadamente 1 µ. Colpos de las membranas lisas. En algunos granos se aprecia un poro difuso. Indice del área polar 0.25, pequeña.

Tabebuia impetiginosa (Mart.) Standl., Estación de Biología Chamela, Jalisco, *S.H. Bullock 1277* (MEXU). Lámina IV, Figuras 40 a 44.

Polen tricolpado, tectado, prolato de 44.8(47.3)50.0 × 32.0(34.3)36.3 µ. P/E= 1.37. Vista polar circular de 37.0(40.5)42.3 µ de diámetro. Exina de 2.5 µ de grosor, sexina y nexina de igual espesor, reticulada con lúmenes de 1.5 a 2 µ de diámetro. Colpos con las membranas lisas. Indice del área polar 0.30, media.

Tabebuia rosea (Bertol.) DC., Estación de Biología Chamela, Jalisco, *S.H. Bullock 83* (MEXU). Lámina V. Figuras 45 a 48.

Polen tricolpado a tricolporoidado, tectado, prolato de 55.0(57.2)59.2 × 36.3(39.6)43.0 µ. P/E= 1.44. Vista polar circular de 49.0(53.0)55.8 µ de diámetro. Exina de 2.5 µ de grosor, sexina dos veces más gruesa que la nexina, reticulada, con lúmenes de aproximadamente 1 µ de diámetro. Colpos cubiertos con membranas lisas, en algunos granos se aprecia un poro difuso y en otros granos se observa un poro de 1(2)3 µ de diámetro. Indice del área polar 0.16, pequeña.

Xylophragma seemannianum (Ktze.) Sandw., Estación de Biología Chamela, Jalisco, *J.A. Solís 679* (MEXU). Lámina V. Figuras 49 a 51.

Polen tricolpado a tricolporoidado, tectado, esferoidal de 50.0(51.3)52.4 × 45.6(47.6)50.0 μ. P/E= 1.07. Vista polar circular de 50.0(52.6)54.0 μ de diámetro. Exina de 2.5 μ de grosor, nexina y sexina de igual espesor, reticulada con lúmenes de 1.0 a 1.5 μ de diámetro. Colpos con membranas lisas, en algunos granos se observa un pequeño poro difuso. Indice del área polar 0.35, media.

CLAVE PARA LA SEPARACION DE GENEROS Y ESPECIES POR MEDIOS PALINOLOGICOS

1.- Polen inaperturado.
- 2.- Polen equinado.............*Adenocalymma inundatum* Lámina I, Figuras 1 a 3
- 2.- Polen perreticulado.
  - 3.- Granos de polen mayores de 70 μ de diámetro.................................. .... *Pithecoctenium crucigerum* Lámina III, Figuras 29 a 31
  - 3.- Granos de polen menores de 70 μ de diámetro.
    - 4.- Lúmenes menores de 1 μ de diámetro...................................... .... *Clytostoma binatum* Lámina II, Figuras 15 a 17
    - 4.- Lúmenes mayores de 1 μ de diámetro.
      - 5.- Exina mayor de 3 μ de grosor.. .... *Cydista aequinoctialis* Lámina II, Figuras 21 a 23
      - 5.- Exina menor de 3 μ de grosor.. .... *Cydista diversifolia* Lámina III, Figuras 24 y 25

1.- Polen tricolporado, tricolpado, o tricolporoidado.
- 6.- Polen tricolporado.
  - 7.- Granos de polen esferoidales, superficie de la exina levemente reticulada... ....*Arrabidaea corallina* Lámina I, Figuras 4 a 6 .... *Tabebuia chrysantha* Lámina II, Figuras 32 a 35
  - 7.- Granos de polen subprolato, superficie de la exina puntitegilada............ .... *Arrabidaea patellifera* Lámina I, Figuras 7 a 9
- 6.- Polen tricolpado o tricolporoidado.
  - 8.- Granos de polen esferoidales.
    - 9.- Granos de polen escabrosos.. ....*Melloa quadrivalvis* Lámina III, Figuras 26 a 28
    - 9.- Granos de polen reticulados o perreticulados.
      - 10.- Indice del área polar pequeña.. ....*Crescentia alata* Lámina II, Figuras 18 a 20
      - 10.- Indice del área polar media.. ....*Xylophragma seemannianum* Lámina V, Figuras 49 a 51
  - 8.- Granos de polen prolatos a subprolatos.
    - 11.- Polen margocolpado...*Arrabidaea viscida* Lámina I, Figuras 10 a 12

11.- Polen nunca margocolpado.

12.- Polen psilado... *Astianthus viminalis* Lámina II, Figuras 13 y 14

12.- Polen reticulado.

13.- Polen menor de 45 μ de diámetro. .... *Tabebuia donnell-smithii* Lámina IV, Figuras 36 a 39

13.- Polen mayor de 45 μ de diámetro.

14.- Lúmenes de 1.5 a 2.0 μ de diámetro. ....*Tabebuia impetiginosa* Lámina IV, Figuras 40 a 44

14.- Lúmenes de más o menos 1 μ de diámetro. .... *Tabebuia rosea* Lámina V, Figuras 45 a 48

CONCLUSIONES

La familia Bignoniaceae es euripalinológica, y al comparar la morfología del polen con las subdivisiones taxonómicas realizadas por Schumann (1895), y Gentry & Tomb (1979), encontramos que estos autores separan a la familia en las siguientes tribus:

BIGNONIEAE: *Arrabidaea, Melloa, Xylophragma, Clystostoma, Cydista, Adenocalymma, Pithecoctenium*

TECOMEAE: *Tabebuia*

CRESCENTIEAE: *Crescentia*

El género *Astianthus* no fue considerado en los sistemas de clasificación mencionados.

Al comparar las divisiones taxonómicas de la familia con la morfología del polen en este trabajo encontramos lo siguiente:

Arrabidaea corallina y *A. viscida* presentan polen tricolporado y pertenece a la tribu Bignonieae.

Melloa quadrivalvis, Xylophragma seemannianum, Tabebuia chrysantha, T. donnell-smithii, T. impetiginosa, T rosea, y *Crescentia alata* con polen tricolpado, tricolporoidado a tricolporado, el primer género con ornamentación escabrosa y los otros tres con ornamentación reticulada a perreticulada. *Melloa* y *Xylophragma* pertenecen a la tribu Bignonieae, *Tabebuia* a la Tecomeae y *Crescentia* a la tribu Crescentieae.

Tabebuia se cita en la bibliografía con polen tricolpado a tetracolpado, sin embargo, en las especies estudiadas para la Estación de Biología Chamela, Jalisco encontramos que las aberturas varían desde la tricolpada, tricolporoidada a tricolporada y tomando en consideración las aberturas, el tamaño del polen, y el tamaño de los lúmenes es factible la separación de las especies.

Clytostoma binatum, Cydista aequinoctialis, Pithecoctenium crucigerum, y *Adenocalymma inundatum* pertenecen a la tribu Bignonieae, los tres primeros géneros presentan polen inaperturado con lúmenes de diferentes diámetros y el último género con polen equinado.

Astianthus viminalis presenta polen tricolpado, psilado, diferente al polen de las otras Bignoniaceae descritas para la Estación de Biología Chamela, Jalisco.

Por todo lo anterior, se puede apreciar que no existe una relación entre las divisiones taxonómicas y la morfología del polen y posiblemente este taxa pueda pertenecer a otra subdivisión taxonómica no considerada por autores como Schumann (1895) y Gentry & Tomb (1979).

En el caso de los taxa estudiados para la estación de Biología Chamela, Jalisco, es factible separar casi todos los taxa por medios palinológicos tomando en consideración el tipo de aberturas que se presentan, la ornamentación, tamaño, forma del polen y el índice del área polar.

Cydista diversifolia fue descrito al microscopio electrónico de barrido por Gentry & Tomb (1979) como pericolpado, sin embargo, el polen de los ejemplares de Chamela, Jalisco se observan inaperturados al microscopio de luz. Así también, estos mismos autores indican que *Cydista aequinoctialis* presenta la mayoría de los granos de polen como inaperturados con reticulo medio, aunque también presentan granos pericolpados. El ejemplar de Chamela Jalisco, presenta polen inaperturado.

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IDENTIFICATION AND DISTRIBUTION OF *CENTAURIUM MUHLENBERGII* (GRISEB.) PIPER AND *C. PULCHELLUM* (SW.) DRUCE (GENTIANACEAE) IN LOUISIANA, MISSISSIPPI, AND TEXAS

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ABSTRACT

Centaurium muhlenbergii is reported as new to Louisiana, Mississippi, and Texas. The species is compared with and distinguished from the apparently closely related *C. pulchellum*. A key to the two species, a list of specimens examined, and a distribution map are also included. Three other *Centaurium* species mentioned as occurring in Louisiana are also discussed.

KEY WORDS: Gentianaceae, *Centaurium*, Louisiana, Mississippi, Texas

Centaurium is a taxonomically difficult genus of about 60 species of Old and New World distribution. Two species that occur in the United States, *Centaurium muhlenbergii* (Griseb.) Piper, a native, and *C. pulchellum* (Sw.) Druce, an exotic from Europe, bear close resemblance to each other. Both are annuals, lack rosettes or may have weakly developed ones, and possess small flowers with corolla lobes 2-5 mm long. The similarity of the two species, coupled with their previous mutually exclusive distributions in the United States (which hinders direct field comparison), have resulted in taxonomic uncertainty concerning the correct status of the plants. Prior to this study, *C. muhlenbergii* was known from central Washington south to central California, western Nevada, and Idaho (Cronquist *et al.* 1983). *Centaurium pulchellum* is widely distributed in eastern United States (Fernald 1950; Small 1933). Both Cronquist *et al.* (1983) and Hickman (1993) consider *C. floribundum* (Benth.) Robinson to be synonymous with *C. muhlenbergii* and further suggest that the latter name may well be reduced to synonymy under *C. pulchellum*. The present paper is intended to clarify the status of *C. muhlenbergii* and *C. pulchellum*, and document their distribution in the states treated. Additionally, reports of *C. calycosum* (Buckl.) Fern., *C. erythraea* Raf., and *C. texense* (Griseb.) Fern. in Louisiana will be evaluated.

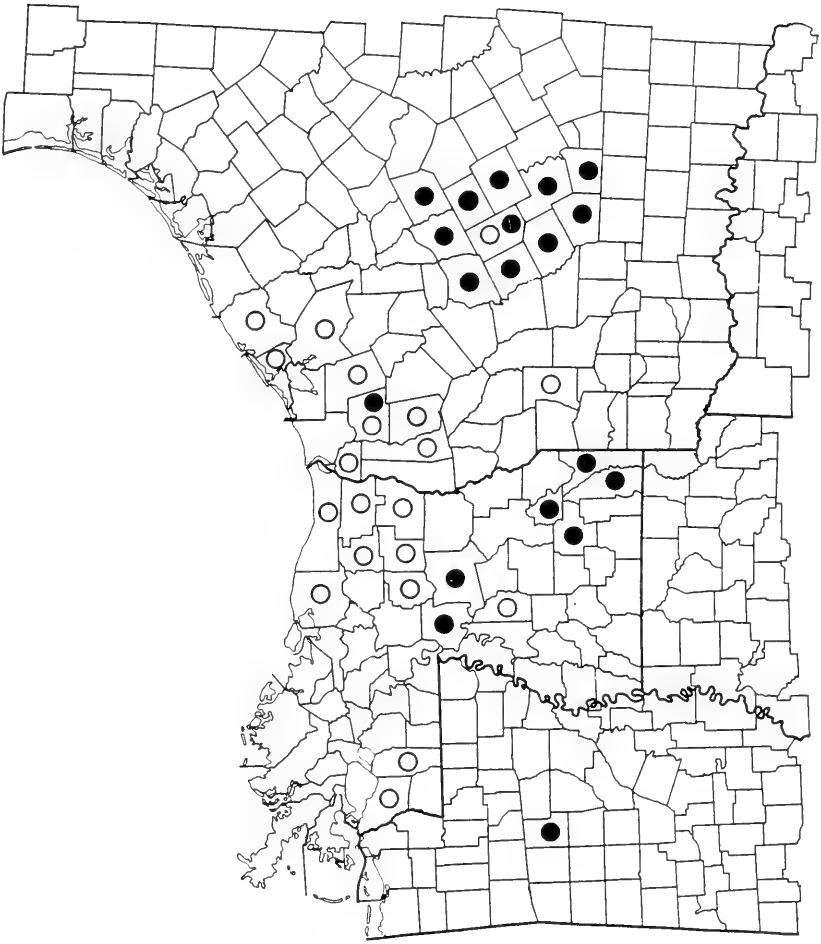

Figure 1. Documented distribution of *Centaurium muhlenbergii* (closed circles) and *C. pulchellum* (open circles) in Texas, Louisiana, and Mississippi.

Table 1. A summary of the major differences between *Centaurium pulchellum* and *C. muhlenbergii.*

	C. pulchellum	*C. muhlenbergii*
Height (cm)	(5)10-18(29)	(19)27-45(55)
Branching	midstem or below	upper 1/3-1/4 of stem
Inflorescence	open, spreading compound dichasium	dense, flat topped umbellate cyme
Flowers	*pedicelled	*sessile
Epicalyx	separated from calyx	at very base of calyx
Peak flowering time	15 April-24 May	8-24 June

* See text for further explanation.

The study is based upon field observations and collections of both species and examination of herbarium specimens or photostatic copies of specimens from ASTC, BAYLU, BRIT, IBE, LAF, LSU, LSUS, LTU, NLU, and TAES.

While *Centaurium muhlenbergii* and *C. pulchellum* have overall similarity, especially flower and leaf characteristics, there are substantial differences (Table 1) that evidence the distinctness of each. One item in the table requires further explanation. Whether a flower is sessile or pedicelled is determined by the location of the epicalyx, the two bracts subtending the calyx. In pedicelled flowers, the epicalyx is slightly separated from the calyx, while in sessile flowers the calyx is immediately subtended by the epicalyx. This trait is more apparent on the lateral flowers of the ultimate cymes.

Although the plants may be distinguished by use of the table, the following key, adapted in part from Hickman (1993), provides for accurate and easy distinction between the two plants.

1. Flowers essentially sessile; inflorescence umbellate-cymose, dense, flat topped; plant normally branching in the upper one-third to one-fourth. ..... *C. muhlenbergii*
1. Flowers pedicelled; inflorescence an open compound dichasium, not flat topped; plant normally branching in the lower one-half. .... *C. pulchellum*

This is the first report of *Centaurium muhlenbergii* (which includes the synonymous *C. floribundum*) in Louisiana, Mississippi, and Texas. The size of the

plant (up to 55 cm), dense clusters of bright pink flowers, colonial nature, and mainly roadside occurrence make the species very easy to locate, thus suggesting it to be a rather recent arrival. This is supported by the earliest known Texas specimen [*Amerson 510* (BRIT)] being collected in 1971 and the earliest located Louisiana specimen [*Thieret 26682* (LAF)] being collected in 1968, but both being misidentified as either *C. pulchellum* or *C. texense*. The only Mississippi record was collected in 1989. Figure 1 shows the documented distribution of the species in the three states.

Specimens examined: Louisiana. Avoyelles Parish: Pinewoods along Big Creek at North Point, ca. 5 miles N of Effie on Hwy 115, 2 Jun 1979, *Allen 8747 & Vincent 2011* (NLU); Bienville Parish: Median of I-20 at rest area W of Hwy 154 and E of Ada exit W of Arcadia, Sec. 8, T18N, R7W, 11 Jun 1987, *Thomas 100093, Dorris, & Day* (NLU); Bossier Parish; East bank of the Red River, 1.2 miles SE of the Barksdale Highway bridge on Hwy 71, Sec. 10, T17N, R13W, 14 Jun 1976, *Leggett & Leggett 1771* (NLU); Caddo Parish: Texas & Pacific Railroad in S Shreveport at intersection of Hollywood & Jewella, Sec. 22, T17N, R14W, 29 May 1982, *Lewis 3515* (NLU); K.C.S. Railroad and Hwy 173 at overpass S of Blanchard, NW part of Sec. 29, T18N, R14W, 10 Jun 1975, *Thomas 45375 & Thomas* (BAYLU [photo], LSU,NLU); Northern edge of Kansas City Southern Railroad Yard W of Hwy 173 at North Lakeshore Drive S of Blanchard, Sec. 19, T18N, R14W, 28 Jun 1979, *Thomas 66460* (BAYLU [photo],LSU,NLU); Prairie area along Wallace Lake Road S of Overton Road S of Shreveport and N of Wallace Lake, Sec. 30, T16N, R13W, 15 Jun 1990, *Thomas 119136 & Raymond* (NLU); I-220 E of Hwy 71 and Hwy 1 N exit in Shreveport, Sec. 15, T18N, R14W, 8 Jul 1994, *Thomas 140263* (BAYLU); Rapides Parish: Roadbank of Hwy 165 and Hwy 3026, just S of Kingsville, Sec. 36, T5N, R1W, 18 Jun 1978, *Pias & Breard 3577* (NLU); "Ruins" of Camp Beauregard, 3 miles SE of Simms, ca. 9 miles NE of Pineville, Sec. 33, 12 Jun 1967, *Thieret 26682* (LAF); Red River Parish: High bluffs of Red River, across from Coushatta, 1.8 miles S of U.S. Hwy 84, 17 Jun 1983, *Gilmore 1833* (LTU). Mississippi. Smith Co.: Tallahala Wildlife Mgmt. Area ca. 1 mi. N of Clear Springs, NW1/4 of NE1/4 Sec. 26, T4N, R9E, 22 Jun 1989, *Carraway 895* (IBE). Texas. Ellis Co.: 5.9 miles N of Avalon on Farm Market Road 55 near Little Onion Creek, 22 Jun 1994, *Holmes 7268 & Wivagg* (BAYLU); Falls Co.: 0.5 mile W of Big Creek on Tx. Hwy 7, ca. 6.5 miles E of Marlin, 17 Jun 1994, *Holmes 7237 & Wivagg* (BAYLU); Freestone Co.: Tx. Hwy 164, 3.3 miles E of the Limestone Co. line, 9 Jun 1994, *Holmes 7165 & Wivagg* (BAYLU); N side Tx. Hwy 164 at Fulton Hill, 4.2 miles E of Donie, 16 May 1995, *Holmes 7683* (BAYLU); Hardin Co.: Between Batson and Saratoga near West Hardin Schoolhouse, 7 Jun 1971, *Amerson 510* (BRIT); Hill Co.: 0.3 mile W of Mt. Calm on Tx. Hwy 31, 22 Jun 1994, *Holmes 7259 & Wivagg* (BAYLU); Johnson Co.: Farm Road 916, 1.5 miles W of the Ellis Co. line, ca. 4.2 miles east of Grandview, 22 Jun 1994, *Holmes 7274 & Wivagg* (BAYLU); Leon Co.: Roadside, Tx. Hwy 7, just E of the Robertson Co. line, ca. 2 miles W of Marquez, 17 Jun 1994, *Holmes 7243 & Wivagg* (BAYLU); Limestone Co.: Tx. Hwy 164, 4.5 miles W of Personville, ca. 100 m east of Turkey Creek, 3 Jun 1994, *Holmes 7138* (BAYLU); Jct. Limestone Co. Roads 905 & 894, just east of Lake Limestone, 17 Jun 1994, *Holmes 7257 & Wivagg* (BAYLU); McLennan Co.: F.M. 3400, ca. 1/2 miles SE of Loop 340, ca. 3 miles SE of Waco, 20 Jun 1991, *Holmes 5278* (BAYLU); Milam Co.: Tx. Hwy 36, just S of the Little River bridge, S of Cameron, 26 Jun 1994, *Holmes 7295 & Wivagg* (BAYLU); Navarro Co.: ca. 3 miles NE of Hubbard on Tx. Hwy 31, just E of the Hill Co. line, 22 Jun 1994, *Holmes 7263 & Wivagg* (BAYLU); Robertson Co.: Tx. Hwy 7, ca. 9.5 miles E of Kosse on Tx. Hwy 7, ca.

80 m east of the Limestone Co. line, 17 Jun 1994, *Holmes 7241 & Wivagg* (BAYLU).

Centaurium pulchellum has long been known to occur in Louisiana and Mississippi (Small 1933). Unfortunately, we have not had access to any specimens from Mississippi, thus further comment is not possible. The species was first reported in Texas by Correll & Johnston (1972). Turner (1993), in a treatment of the genus for Texas, provided documentation of the species in Hardin and Brazoria counties. Figure 1 depicts the distribution of the species in Louisiana and Texas. The plant is often misidentified as *C. texense*.

Specimens examined: Louisiana. Allen Parish: Paved road W of U.S. 165 at a pumping station three miles N of Kinder, Sec. 13, T6S, R5W, 3 Apr 1982, *Thomas 80607 & Allen* (NLU); Sun Oil Co. Road, W of U.S. 165, 1.2 miles N of Kinder, Sec. 24, T6S, R5W, 25 May 1983, *Thomas 83728* (NLU); Allen Parish Road 122, ca. 1/2 mile W of U.S. 165, ca. 2 miles N of Kinder, 20 Apr 1981, *Allen 10663* (NLU); Prairie strip S of Railroad and U.S. 90, ca. 1 mile E of Midland, 6 May 1989, *Allen 16423* (NLU); U.S. 190 just W of the Calcasieu River W of Kinder, Sec. 30, T6S, R5W, 25 May 1983, *Thomas 83735* (NLU); Beauregard Parish: Roadside along U.S. Hwy 171, Beauregard-Calcasieu Parish line, 3 May 1975, *Adams 1841* (LTU); Calcasieu Parish: Cleared area W of DeQuincy Middle School beside La. 12 in W part of DeQuincy, 5 Jun 1992, *Thomas 129558* (NLU); Railroad tracks and La. 12 at the Railroad Museum in DeQuincy, Sec. 18, T7S, R10W, 5 Jun 1992, *Thomas 129551* (NLU); La. 27 S at I-10E exit on south side of Sulphur, Sec. 3, T10S, R10W, 22 Jun 1982, *Thomas 81554 & Kessler* (NLU); Roadside along U.S. Hwy 171, Calcasieu-Beauregard Parish line, 3 May 1975, *Adams 1840* (LTU); Ca. 2.5 miles S of Gillis, 4 May 1968, *Thieret 28829* (LAF); Cameron Parish: Roadbank at bridge on Sweet Lake camp road about 0.2 mile S of Cameron Parish, Road 445, Secs. 24 & 25, T12S, R8W, 12 May 1984, *Thomas 88555 & Dutton 1788* (NLU); Jct. of La. 717 and Hwy 14 SE of Lake Arthur, Secs. 2 & 11, T12S, R3W, 19 Apr 1984, *Thomas 88020 et al.* (NLU); Jct. of Cameron Parish Road 445 and Precht Road, 1.0 mile W of La. 384 & NW of Sweet Lake, Sec. 24, T12S, R8W, 12 May 1984, *Thomas 88558 & Dutton 1791* (NLU); Roadbank along a 0.3 miles section of Cameron Parish Road 421, just E of La. 384 and S of the Calcasieu Parish line, NW of Grand Lake, Sec. 4, T12S, R9W, 13 Apr 1984, *Dutton 1223 & Taylor 6700* (NLU); La. 14 at Vermilion Parish line E of Lake Arthur, Sec. 2, T12S, R3W, 19 Apr 1984, *Thomas 87958* (NLU); Evangeline Parish: La. 104, 0.3 mile E of Bayou Nezpique Bridge at Allen Parish, 23 May 1978, *Cormier 726* (NLU); Jefferson Davis Parish: La. 97 just S of I-10, ca. 1 mile NE of Jennings, 5 Jun 1980, *Vincent 3646* (LSU); Lasalle Parish: Median of U.S. 165 at U.S. 84 in Tullos, Sec. 25, T10N, R1E, 17 May 1980, *Thomas 71298 & Thomas* (NLU); Tullos, just NW of La. Hwy 125 and about 1.2 miles SW of U.S. Hwy 84, 22 Apr 1988, *Boyd 3000* (LTU); St. Tammany Parish: I.H. 12 & La. 434 W of Hammond, 3 May 1989, *Urbatsch 5451 & Cox* (LSU); Tangipahoa Parish: La. 22 at crossroads just W of Bedico Creek W of Bedico and E of Ponchatoula, Sec. 45, T7S, R9E, 17 May 1983, *Thomas 83480 et al.* (NLU); Vermilion Parish: Orange Road off La. 82 S along Vermilion River, 7 miles S of Abbeville, Secs. 6 & 7, T12S, R3E, 30 May 1987 *Slaughter 509* (NLU); La. 14 at Cameron Parish line E of Lake Arthur, Sec. 35, T11S, R3W, 19 Apr 1984, *Thomas 87972 et al.* (NLU). Texas. Brazoria Co.: Tx. Hwy 2004 at New Bayou S of Alvin, 5 Apr 1986, *Brown 9888* (NLU); Galveston Co.: Roadside, Texas Hwy along beach five miles W of Galveston, 31 Mar 1972, *Lowery 675* (LTU); Hardin

Co.: Hwy 96, Lumberton, 6 May 1995, *Singhurst 3067* (BAYLU); 2.2 miles E of Saratoga along and S of Hwy 770, 30 Jun 1984, *McLeod s.n.* (ASTC); Harris Co.: Intersection of Pasadena Blvd. & Underwood Street, Deer Park, 18 May 1985, *Brown 8770* (ASTC); Eisenhower Park S of the Dam at Lake Houston, 12 May 1984, *Brown 7296* (NLU); Jasper Co.: 3.1 miles S of Farm Market road 105 from its Jct. with Farm Market 1131, 22 May 1988, *Jones & Jones 1664* (TAES); 3.4 miles E of Buna along Farm Market Road 263, 14 May 1985, *ig. leg.* (ASTC); Liberty Co.: U.S. Hwy 90 between Dayton & bridge over Cedar Bayou, 23 May 1987, *Brown 11140* (NLU); Limestone Co.: Tx. Hwy 174, ca. 13 miles E of Groesbeck, near road to Lake Limestone, 16 May 1995, *Holmes 7684* (BAYLU); Orange Co.: I-10 right-of-way at Adams Bayou east of Orange, 14 May 1974, *Thomas 38978 et al.* (NLU); Rusk Co.: Ca. 3.5 miles N of the junct. of Tx. Hwy 322 & Tx. Hwy 259 on Hwy 259, 20 April 1988, *Nixon 16617* (ASTC,BAYLU [photo]); Tyler Co.: U.S. Hwy 190 at Steinhagen Lake, just W of the Jasper Co. line, 14 Apr 1995, *Le Noir s.n.* (BAYLU).

Further comment on *Centaurium* in Texas is not needed since Turner (1993) provided an accurate account of the species in the state and, as mentioned, is not possible for Mississippi because of the lack of specimens. Several other species of *Centaurium*, however, have been reported in Louisiana. With clarification of the status of *C. pulchellum* and *C. muhlenbergii*, it is now possible to comment on these reports.

Centaurium calycosum (Buckl.) Fern. was reported by MacRoberts (1987) as occurring in DeSoto Parish, based upon *Gilmore 1833* (LTU). Turner (1993) gives the distribution of *C. calycosum* as being primarily in the western portions of the Edwards Plateau of Texas, and several adjacent areas, such as México. It is reported by Cronquist *et al.* (1983) as occurring in New Mexico, Arizona, Utah, *etc.* Upon examination, *Gilmore 1833* proved to be *C. muhlenbergii* collected near Coushatta in Red River Parish.

MacRoberts (1987) also reported *Centaurium erythraea* Raf. from Caddo Parish, citing *MacRoberts 550, 923, 1201, & 2688* (all LSUS). This species is an European native that has become naturalized from northern coastal California to Washington (Hickman 1993). The plant is similar to *C. muhlenbergii* in appearance but is a biennial with a conspicuous basal rosette and has corolla lobes 5-7 mm long. Examination of clear photocopies of these specimens showed they lacked basal rosettes and appeared to be annuals. They are thus referable to *C. muhlenbergii*.

Centaurium texense (Griseb.) Fern. was reported from Rapides and Calcasieu parishes by Thieret (1968). The distribution of this species includes the eastern edge of the Balcones Escarpment of Texas, eastern Oklahoma, northwestern Arkansas, and southwestern Missouri. The plant is limited to dry, limestone derived soils and eroded limestone slopes, glades, and roadcuts, all non-existent in Louisiana. The specimens cited by Thieret (1968), *Thieret 26682* and *28829* (both LAF) proved to be *C. muhlenbergii* and *C. pulchellum* respectively.

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PHYLLOSTACHYS AUREA RIV. (GRAMINEAE; BAMBUSEAE) IN TEXAS

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ABSTRACT

Phyllostachys aurea is shown to be widely distributed in the eastern part of Texas.

KEY WORDS: Gramineae, *Phyllostachys*, Texas

Phyllostachys aurea Riv., commonly called yellow bamboo, is a native of China that was introduced into the southern United States prior to 1870 (Rehder 1986) as an ornamental, barrier planting, or for soil stabilization and erosion control. The plant is a vigorous colonizer and readily escapes containment or is commonly abandoned. The size of some colonies, sometimes over 100 m in length, indicates that the species, once established, can persist for extended periods of time. The species may grow to 6 m tall and forms dense stands, often to the exclusion of other vegetation. The genus *Phyllostachys* is characterized by the culms being flattened on one side above each node, a trait useful in distinguishing it from the native *Arundinaria gigantea* (Walt.) Muhl. Additional traits of *Phyllostachys aurea* are its yellow stems, leaf sheathes generally without spots but with two tufts of bristles at the apices, and presence of 2-3 linear leaves 5-12 cm long and 1-2 cm wide at the tip of each branch. Additional information can be found in Allen (1992).

The plant is included as part of the naturalized flora of Louisiana by Allen (1992) and by Thomas & Allen (1993). It is also present in Mississippi (pers. comm. with Sidney McDaniel of IBE). Gould (1975) did not include *Phyllostachys* in his treatment of the grasses of Texas nor was it included in the latest checklist of the

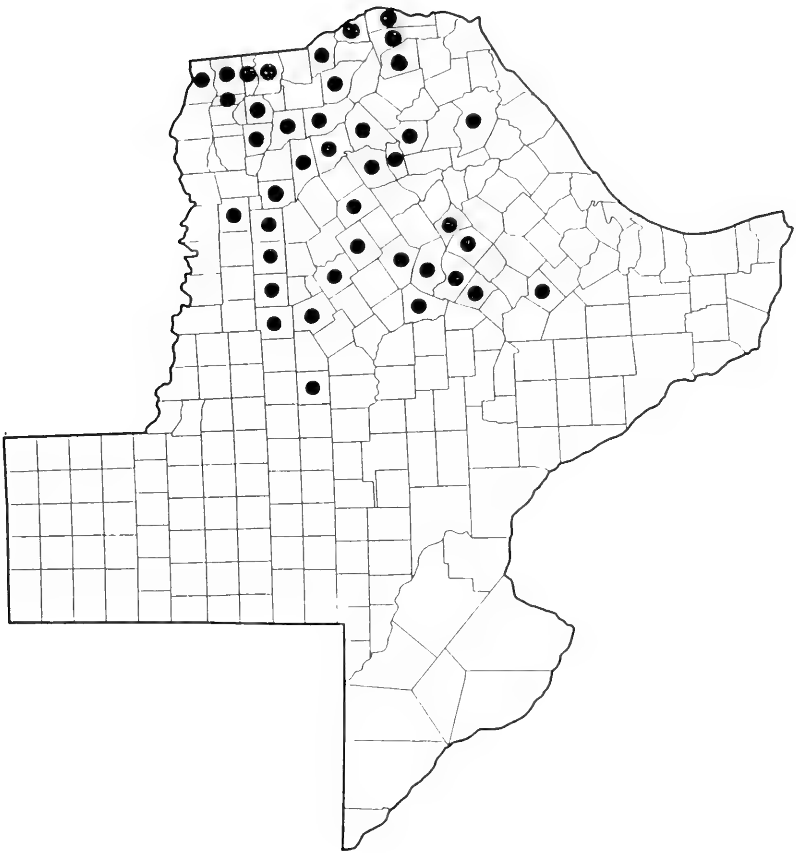

Figure 1. Distribution of *Phyllostachys aurea* in Texas.

vascular plants of the state (Hatch *et al.* 1990). Its widespread occurrence in Texas (Figure 1), spread to areas where it seems not to have been intentionally planted, and persistence, warrants its inclusion as part of the naturalized flora of Texas.

Jenzan (1976) gives the intermast period of *Phyllostachys aurea* as 28-29 (2× 14-15) years, a figure based on observations of plants introduced to [mainland] Europe and England. He mentions that the time period is more fixed in the center of the natural distribution of a species and synchrony may be lost under cultivation or if the plants are feral, thus the Texas plants may not follow this schedule. He suggests the long interval between flowering evolved to escape seed predation. At this time, no fertile materials are known from Texas.

Representative specimens: Anderson Co.: Ca. 0.9 mi E of jct. of U.S. Hwy 84 and Loop 256 on Hwy 84, Palestine, 20 Feb 1996, *Singhurst 4776* (BAYLU). Bastrop Co.: N. side Tx. Hwy 21, ca. 3.6 mi NE of jct. of Tx. Hwy 21 and FM 535, 3 Dec 1995, *Singhurst 3621* (BAYLU). Bell Co.: Royal St., ca. 200 m E of Stagecoach Road, Salado, 9 Jul 1995, *Holmes 7805* (BAYLU). Bosque Co.: Walnut Springs, Tx. Hwy 144, ca. 150 m N of FR 927, 27 Oct 1995, *Holmes 7939* (BAYLU). Bowie Co.: Jct. of Hwy 67 and Sulfur River, ca. 0.8 mi. N on Hwy 67, 6 Mar 1996, *Singhurst 4809* (BAYLU). Burnet Co.: FM 2147, 1/2 mi. W of U.S. Hwy 281, 28 Jan 1996, *Wivagg s.n.* (BAYLU). Callahan Co.: I-20, 1.7 mi. E jct. with FM 604, Clyde, 10 Feb 1996, *Singhurst 4775* (BAYLU). Cass Co.: Ca. 1.15 mi. S of jct. of FM 1154 & FM 96 on FM 96, 6 Mar 1996, *Singhurst 4810* (BAYLU). Cherokee Co.: Ca. 2.3 mi. E of Alto at jct. of U.S. Hwy 69 and Tx. Hwy 21 on Hwy 21, 29 Jan 1996, *Singhurst 4764* (BAYLU). Collin Co.: Ca. 0.3 mi. S of jct. of Park Place Dr. and Jupitor Rd., Allen, 30 Mar 1996, *Singhurst 4817* (BAYLU). Dallas Co.: [exact location not given] cultivated in calcareous clay, forming a dense thicket 6 m tall, evergreen, specimen consists of 2 branches from root sprouts 0.6 m tall, outside of fence, 20 Dec 1967, *Shinners 32022* (BRIT). Erath Co.: Dublin, Patrick St. Church, U.S. Hwy 67 ca. 0.5 mi. N of Tx. Hwy 6, 29 Mar 1996, *Stevens 196* (BAYLU). Harris Co.: I-45 South at jct. of Hardy Toll Road, 1/2 mi. S of Rayford Road, 27 Dec 1995, *Borowski s.n.* (BAYLU). Harrison Co.: Ca. 5.6 mi. ENE of jct. of Hwy 43 and Hwy 59 at Marshall, 14 May 1996, *Singhurst 4838* (BAYLU). Hays Co.: Ca. 0.5 mi. W of Jct. of I-35 and FM 150, ca. 0.1 mi. N of FM 150, Kyle, 3 Dec 1995, *Singhurst 3627* (BAYLU); Jct. of I-35 N service road and County Road 105, Buda, 22 Oct 1995, *Borowski 185* (BAYLU). Henderson Co.: S side Tx. Hwy 175, ca. 5 mi. WNW of jct. Tx. 175 and Loop 317, Athens, 26 Nov 1995, *Singhurst 3628* (BAYLU); Tx. Hwy 2329 near arm of Cedar Creek Reservoir, 3-4 mi. S of Tx. Hwy 316, 24 Sep 1995, *Borowski 179* (BAYLU). Houston Co.: Ca. 0.3 miles E of jct. of Tx. Hwy 21 and FM 2967 on Tx. Hwy 21, 3 Dec 1995, *Singhurst 3629* (BAYLU). Jasper Co.: Ca. 4.8 mi. ENE of jct. of Hwy 96 and FM 1007 at Browndell, Rocky Reserve, The Nature Conservancy of Texas, 15 Apr 1996, *Singhurst 4833* (BAYLU). Kaufman Co.: Ca. 0.4 mi. E of jct. of old Hwy 174 and FM 274 in Kemp, 15 Mar 1996, *Singhurst 4816* (BAYLU). Lee Co.: Ca. 2.0 mi. NE of jct. of FM 619 and FM 695 on FM 695, 31 Jan 1995, *Singhurst 4765* (BAYLU). Leon Co.: 0.75 mile N of Centerville on W service road of I-45, 26 May 1995, *Holmes 7697* (BAYLU). Limestone Co.: Tx. Hwy 14 between Groesbeck and Mexia, 0.2 mi. S of Park Road 28 (entrance to Ft. Parker State Park), 16 Sep 1995, *Holmes 7886, Do, & Morgan* (BAYLU). Madison Co.: Ca. 3.7 mi. W of jct. of Tx. Hwy 21 and FM 1428 on S side of Tx. Hwy 21, 3 Dec 1995, *Singhurst*

3631 (BAYLU). Marion Co.: Ca. 1.8 mi S of jct. of Hwy 43 and Hwy 49 at Smithland, 14 May 1996, *Singhurst 4837* (BAYLU). McLennan Co.: Slopes and bluffs above the Brazos River, Cameron Park, Waco, 16 Feb 1995, *Holmes 7593* (BAYLU). Morris Co.: Dangerfield State Park, ca. 1.7 mi. SSE of Jct. of park road and Hwy 49, 7 Mar 1996, *Singhurst 4813* (BAYLU). Nacogdoches Co.: 4 mi. E of jct. of Tx. Hwy 21 and FM 225 on Tx. Hwy 21, 3 Dec 1995, *Singhurst 3632* (BAYLU). Newton Co.: Ca. 1.9 mi. N of jct. of Hwy 87 and R255 at Mayflower Community, 15 Apr 1996, *Singhurst 4836* (BAYLU). Palo Pinto Co.: Ca. 0.9 mi N of jct. of Hwy 180 and Hwy 281 on Hwy 281, 22 Dec 1995, *Singhurst 3989* (BAYLU). Parker Co.: Ca. 1 mi. W of jct. of Hwy 180 and South Bowie St. on Hwy 180, Weatherford, 23 Dec 1995, *Singhurst 3990* (BAYLU). Sabine Co.: Ca. 0.7 mi. W of Jct. of Hwy 87 and FM 2426 on FM 2426, 15 Apr 1996, *Singhurst 4835* (BAYLU). Shelby Co.: Ca. 2.3 mi. N of jct. of Hwy 7 and county line across from White Rock Cemetery, 17 Mar 1996, *Singhurst 4815* (BAYLU). Smith Co.: Management and Research Station, Tx. Parks & Wildlife Dept., Tyler; ca. 1.3 mi. S of jct. of Hwy 64 & FM 848, 15 Mar 1996, *Singhurst 4814* (BAYLU). Tarrant Co.: Jct. of University Drive and Colonial, Fort Worth, 14 Oct 1995, *Borowski 183* (BAYLU); Embankment of Tx. Hwy 121 and Tx. Hwy 329 near Bedford, 14 Oct 1995, *Borowski 184* (BAYLU). Travis Co.: Road leading to Nature Center, Zilker Park, Austin, 7 Oct 1995, *Borowski 182* (BAYLU); Tx. Hwy 71, 2 mi. N of jct. with Tx. Hwy 2244, 7 Oct 1995, *Borowski 180* (BAYLU). Tyler Co.: Ca. 2.4 mi. S. of Jct. of FM 1943 and Hwy 69 at Warren, ca. 0.5 mi. ENE on road along N side of John H. Kirby Forest, 15 Apr 1996, *Singhurst 4834* (BAYLU). Upshur Co.: Ca. 2.3 mi. S of Jct. of Hwy 259 & FM 2706, S of Lonestar on Hwy 59, 5 Mar 1996, *Singhurst 4808* (BAYLU). Walker Co.: Huntsville, Old Madisonville Hwy at Smith Hill, 27 Jan 1996, *Stevens 171* (BAYLU). Williamson Co.: County Road 481 across from Adina Church Road, 10 Feb 1996, *Stevens 187, Gooch, & Holmes* (BAYLU). Wilson Co.: FR 1107, 200 m N of Jct. with U.S. Hwy 87, Pandora, 9 Feb 1996, *Stevens 173, Gooch, & Holmes* (BAYLU). Wood Co.: County Road 1600, Alba, 24 Sep 1995, *Borowski 178* (BAYLU).

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NOMENCLATURAL COMBINATIONS IN *SCHIZACHYRIUM* (POACEAE: ANDROPOGONEAE)

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ABSTRACT

The following nomenclatural combinations in the Poaceae are proposed: ***Schizachyrium spadiceum*** (J. Swallen) *comb. nov.*; and ***Schizachyrium scoparium*** (A. Michaux) G. Nash var. ***stoloniferum*** (G. Nash) *comb. et stat. nov.*

KEY WORDS: *Schizachyrium, Schizachyrium scoparium, Schizachyrium scoparium* var. *stoloniferum, Schizachyrium spadiceum, Schizachyrium stoloniferum*, nomenclature, Poaceae

Schizachyrium spadiceum (J. Swallen) J. Wipff, *comb. nov.* BASIONYM: *Andropogon spadiceus* J. Swallen, Proceedings of the Biological Society of Washington 56:82 (1943). TYPE: MEXICO. Coahuila: Cañon de Madera, western side of Sierra de los Guajes, about 4 km east of Rancho Buena Vista, 7 Sept 1941, *Robert M. Stewart 1504* (HOLOTYPE: US, accession #154691).

Schizachyrium spadiceum, restricted to Coahuila, México and Brewster County, Texas, is the first reported species of *Schizachyrium* with a panicle of paired branches. All of the other reported species of *Schizachyrium* have spicate racemes. This should not be surprising since there are species of *Andropogon* that have spicate racemes (e.g., *A. textilis* A. Rendle, *A. fastigiatus* O. Swartz, and *A. gracilis* K. Sprengel), and there are also species that may have either spicate racemes or panicles of paired branches (e.g., *A. urbanianus* A. Hitchcock, *A. reedii* A. Hitchcock & E. Ekman, and *A. kelleri* E. Hackel). It appears that too much significance has been placed on the condition of spicate racemes vs. panicles of primary branches; more reliable characters can be found in the lower glume of the sessile spikelet, the internodes of the central axis, and the pedicels (Clayton 1964). Clayton (1964) pointed out that the significance attached to spicate racemes probably arose from the value of this character in segregating *Schizachyrium* Nees von Esenbeck. Excluding the panicles of paired branches, *S. spadiceum* possesses all of the below mentioned generic characters that

are used to delimit *Schizachyrium* from *Andropogon* and justify its placement into *Schizachyrium*.

Schizachyrium is most closely related to *Andropogon* sect. *Leptopogon* (Clayton 1964; Clayton & Renvoize 1986). Clayton (1964) and Clayton & Renvoize (1986) provided the following characters to delimit *Schizachyrium* and *Andropogon* sect. *Leptopogon*, with the inflorescence character being amended to accommodate *Schizachyrium spadiceum*.

Schizachyrium: Inflorescence a spicate raceme or panicle of paired branches (i.e., *S. spadiceum*); first glume of sessile spikelet convex on the back with several intercarinal veins; internodes and pedicels clavate to linear (but then often widening at the tip); the apex of the internode usually conspicuously cup-shaped with a fimbriate rim; upper lemma bilobed or deeply cleft almost to the base.

Andropogon sect. *Leptopogon*: Inflorescence a panicle of 2-several digitate branches or a spicate raceme (e.g., *A. gracilis* K. Sprengel); first glume concave; intercarinal area membranous, hyaline or translucent, and veinless between the keels, or rarely with 1-2 veins in the translucent or hyaline, concave, intercarinal area [e.g., *A. tenarius* A. Michaux (variable, veins present or absent)]; internodes and pedicels linear to filiform; the apex of the internode shallowly cup-shaped; upper lemma bifid up to 1/4 of its length, very rarely more, but never beyond the middle.

The following description of *Schizachyrium spadiceum* has been expanded from Swallen (1943).

Plants perennial, 60-95 cm tall, cespitose, without rhizomes or stolons, **culm** erect, terete, glabrous. **Leaves** glaucous. **Sheaths** compressed, keeled, scaberulous (glabrous), occasionally with a few scattered trichomes; the lower sheaths longer than the internodes and the upper shorter than the internodes. **Ligule** 1.0-1.5 mm long, a membrane, truncate, erose-ciliate. **Blade** 10-25 cm long, 2.0-2.5 mm wide, flat or folded, scaberulous, young blades ciliate in lower portion with trichomes 4-7 mm long, these often being lost in age. **Inflorescence** a panicle of paired branches, **branches** 3.5-6.0 cm long, 7-10 nodes; inflorescence exserted or partially enclosed in sheath; **sheath** (subtending inflorescence) 5.3-8.6 cm long; **blade** 0.5-39.5 mm long; **peduncle** 4.6-9.0 cm long. **Internode** (of inflorescence branch) 4.0-6.3 mm long; linear becoming wider, slightly swollen, at the apex; apex conspicuously cup-shaped with a fimbriate rim; lower 1/3-1/2 of internode and pedicel ciliate, but upper portion, abaxially, densely white villous with trichomes 4-7 mm long; internodes straight, without a membranous, hyaline or translucent, median groove. **Sessile spikelet** 7-8 mm long, golden to chestnut brown and the apex usually green; callus of white trichomes to 2 mm long. **First glume** 7-8 mm long; 7-11 veins, (4-)5-7 equidistant intercarinal veins, green; coriaceous, dorsally compressed, two-keeled, back of glume convex, glabrous, smooth, scaberulous on keels and veins in the upper portion; margins variously ciliolate. **Second glume** 6.5-7.0 mm long, 3-veined (lateral veins obscure, sometimes only faintly visible in the upper 1/2); subcoriaceous, laterally compressed, enclosing florets; glabrous except for ciliolate margins and scaberulous mid-vein at apex. **First lemma** 4.8-5.8 mm long, veinless, hyaline membrane; glabrous, margins ciliolate; awnless; neuter. **Second lemma** 4.1-5.0 mm long, 3-veined; veined portion of lemma, in the center, chartaceous and the rest of the lemma a hyaline membrane, margins variously ciliolate; apex cleft 1/3-1/2 of lemma, **teeth** 1.7-

2.3 mm long, awned between cleft; **awn** 14.2-17.2 mm long, once geniculate, tightly twisted below the bend, lower segment 5-6 mm long, terminal segment straight, 8.7-11.2 mm long. **Second palea** 1.7-2.0 mm long, veinless; hyaline membrane, margins ciliolate. **Anther** 1.9-2.3 mm long; 3 stamens. **Caryopsis** 2.6-3.2 mm long, 0.70-0.75 mm wide; dark reddish purple. **Pedicelled spikelet** 0.8-4.0 mm long, neuter, greatly reduced, with only a first glume developed, awnless; **pedicel** 5-6 mm long; basal callus of trichomes to 2 mm long; lower 1/3-1/2 (2/3) ciliate, upper portion, abaxially, densely white villous with trichomes 4-7 mm long; without a membranous, hyaline or translucent, median groove. **Chromosome number** unknown.

Johnston (1981) commented that in the field *Schizachyrium spadiceum* has a strong superficial resemblance to *Schizachyrium scoparium* (A. Michaux) G. Nash.

Schizachyrium scoparium (A. Michaux) G. Nash var. ***stoloniferum*** (G. Nash) J. Wipff, *comb. et stat. nov.* BASIONYM: *Schizachyrium stoloniferum* G. Nash *in* J.K. Small, *Flora of the Southeastern U.S.* 59, 1326 (1903). *Andropogon stolonifer* (G. Nash) A. Hitchcock, American Journal of Botany 2:299 (1915). *Schizachyrium stoloniferum* G. Nash var. *stoloniferum* [autonym created by *Schizachyrium stoloniferum* G. Nash var. *wolfei* H. DeSelm, Sida 6(2):114-115 (1975)]. TYPE: UNITED STATES. Florida: *Chapman* (HOLOTYPE: NY).

Schizachyrium stoloniferum G. Nash var. *wolfei* H. DeSelm, Sida 6(2):114-115 (1975). TYPE: UNITED STATES. Florida: Osceola Co.; Four miles northwest of Loughman, 14 October 1960, *Ray, Lakela, & Patman 10494* (HOLOTYPE: USF).

Chase (1951) reported that *Schizachyrium stoloniferum* resembled *S. scoparium* and from examining her descriptions of the two taxa the only significant difference between the two taxa was the presence of creeping scaly rhizomes in *S. stoloniferum*. In a systematic study of the *S. scoparium* complex, Bruner (1987) concluded that *S. stoloniferum* was conspecific with *S. scoparium* and should be recognized at the varietal level. However, he also considered *Andropogon scoparius* A. Michaux var. *polycladus* F. Lamson-Scribner & C. Ball as conspecific with *S. stoloniferum* and proposed a new combination: *S. scoparium* var. *polycladus* (F. Lamson-Scribner & C. Ball) J. Bruner, *ined.* and treated *S. stoloniferum* as a synonym. However, this new combination was validly published by Reed (1987), but it was probably in the sense of Fernald (1950) and not including *S. stoloniferum*, because the combinations in Reed (1987) were made in preparation for the *Flora of Central Eastern United States* (Maryland, Delaware, Virginia, and West Virginia) and *S. stoloniferum* is restricted to Florida, and southern Georgia and Alabama.

Bruner (1987) treated, without any specific explanation, *Andropogon scoparius* var. *polycladus* as conspecific with *Schizachyrium stoloniferum*, whereas Nash (1912), Hitchcock (1935), Chase (1951), and Gandhi (1989) treated var. *polycladus* as a synonym of *Schizachyrium* (*Andropogon*) *scoparium* (= *Schizachyrium scoparium* var. *scoparium*). Nash (1912), Hitchcock (1935), Fernald (1950), Chase (1951), and Gandhi (1989) characterized var. *polycladus* as non-rhizomatous, whereas Bruner (1987) considered it rhizomatous. After examining photographs of the type specimens of var. *polycladus* and *S. stoloniferum* I agree with Gandhi (1989) that the type specimen of var. *polycladus* does not possess rhizomes, whereas the type

of *S. stoloniferum* does have rhizomes. Lamson-Scribner & Ball (1901) in their original description of var. *polycladus* never mention this taxon as having rhizomes. The following is the original description by Lamson-Scribner & Ball (1901) for var. *polycladus*: "Stout, 9 to 12 dm. high, glabrous, somewhat glaucous; panicles large, much branched".

Another difference between Bruner (1987), and Lamson-Scribner & Ball (1901), Nash (1912), Hitchcock (1935), Fernald (1950), Chase (1951), and Gandhi (1989), is in the reported distributions of these taxa. Bruner (1987) commented that *Schizachyrium stoloniferum* is ". . . ecologically restricted to specific habitats in the southeastern United States and spatially isolated from the rest of *S. scoparium*, . . .". Bruner reports the distribution of *S. stoloniferum* (including var. *polycladus*) as occurring throughout Florida, and southern Georgia and Alabama, on the sandy soils of woodland openings and roadsides. However, he does not report *S. scoparium* var. *scoparium* as occurring in Florida. Therefore, if *S. scoparium* var. *scoparium* is not recognized as occurring in Florida, and since the type for var. *polycladus* was collected in Manatee County, Florida, it is understandable why Bruner treated this taxon as conspecific with *S. stoloniferum*. Nash (1912), Hitchcock (1935), Fernald (1950), Chase (1951), and Gandhi (1989) all report *S. scoparium* (= var. *scoparium*) as occurring in Florida. Bruner (1987) not only reports different distributions for *S. scoparium* var. *scoparium*, but also greatly restricts the distribution of var. *polycladus* from what has been reported.

Fernald (1950), recognizing var. *polycladus* as a distinct variety of *Andropogon scoparius*, reported its distribution as occurring in dry woods from Texas to Florida and México, north to New Jersey through eastern Missouri and Pennsylvania. Lamson-Scribner & Ball (1901) give the following additional distributions for var. *polycladus*, "Tracy's No. 5330, from Biloxi, Mississippi, and a plant collected by John K. Small on the slopes and summit of Stone Mountain, Georgia, September 6-12, 1894, belong here." Stone Mountain is a granite dome located in northwestern Georgia, east of Atlanta.

No data were found supporting the treatment of *Andropogon scoparius* var. *polycladus* and *Schizachyrium stoloniferum* as conspecific (Bruner 1987), therefore I am treating var. *polycladus* as a synonym of *S. scoparium* var. *scoparium* as did Nash (1912), Hitchcock (1935), Chase (1951), and Gandhi (1989). However, I do not agree with Gandhi (1989) in the placement of *S. stoloniferum* as a synonym of *S. scoparium* var. *littorale* (G. Nash) F. Gould.

Schizachyrium scoparium var. *stoloniferum* and *S. scoparium* var. *littorale* occupy different habitats and have different growth habits. *Schizachyrium scoparium* var. *stoloniferum* is found in sandy woodlands and roadsides, whereas *S. scoparium* var. *littorale* grows on the shifting, coastal sands. *Schizachyrium scoparium* var. *stoloniferum* is strongly rhizomatous, whereas, *S. scoparium* var. *littorale*, as Bruner (1987) also reported, is not rhizomatous. *Schizachyrium scoparium* var. *littorale* only appears rhizomatous due to the continual burial of the culms and the subsequent decay of the sheath and blades from the culms. This results in the buried culms superficially resembling rhizomes. It is my opinion that *S. scoparium* var. *littorale* and *S. scoparium* var. *stoloniferum* represent two different and recognizable taxa.

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LAS COMUNIDADES CON *CORRYOCACTUS BREVISTYLUS* DEL SUR DEL PERU

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ABSTRACT

On a phytosociological study of the Southern Peruvian Andes, we describe the cactus communities from the western slopes of the Andes. As a result, we propose the following novelties: ***Opuntietea sphaericae*** *classis nova*, ***Oreocereo leucotrichi-Neoraimondietalia arequipensis*** *ordo novo*, ***Corryocaction brevistyli*** *allianza nova*, ***Corryocacto aurei-Browningietum candelaris*** *associatio nova*, and ***Oreocereo tacnaensis-Corryocactetum brevistyli*** *associatio nova*.

KEY WORDS: Cactaceae, phytosociology, Perú

RESUMEN

En un estudio fitosociológico de los Andes del sur Peruanos, describimos las communidades de cactus de las laderas occidentales Andinas. Como resultado se proponen las siguentes novedades: ***Opuntietea sphaericae*** *classis nova*, ***Oreocereo leucotrichi-Neoraimondietalia arequipensis*** *ordo novo*, ***Corryocaction brevistyli*** *allianza nova*, ***Corryocacto aurei-Browningietum candelaris*** *associatio nova*, and ***Oreocereo tacnaensis-Corryocactetum brevistyli*** *associatio nova*.

PALABRAS CLAVE: Cactaceae, fitosociológica, Perú

INTRODUCCION

El Perú es uno de los paises de América con mayor diversidad de cactáceas. Sus representantes se encuentran distribuidos por todo el país aunque la mayor

concentración aparece en las vertientes áridas occidentales de los Andes, entre 1000 y 3000 m de altitud [T= 15-20°C, P= 30-70 mm] (Rauh 1979).

Al parecer, en la costa y Andes del norte del Perú, se encuentran en mayor proporción los elementos más antiguos de la vegetación peruana (Solbrig 1976)- *Acacia, Bulnesia, Loxopterygium, Prosopis* (. . .)- que además, muchos de ellos, son los que aparecen en la sabana chaqueña (al S de la Cuenca Amazónica), como por ejemplo, *Cercidium praecox, Geoffroea decorticans, Parkinsonia aculeata,* y *Prosopis pallida* (Cárdenas 1945; Bernardi 1984). La presencia de algunas de estas plantas en los valles desérticos e interandinos del centro y sur del Perú (Fortaleza, Ica, Junín, Nazca, y Tacna) demuestra la existencia de una vegetación de tipo chaqueño en los primeros períodos de la formación de los Andes. El levantamiento de la cordillera y la intensificación de la corriente de Humboldt durante el Pleistoceno, originó una gran zona árida con elevada cantidad de endemismos al W de los Andes (Müller 1985; Galán de Mera *et al.* 1995). En la Tabla 1 mostramos el alto número de endemismos inventariados en las laderas áridas occidentales del Perú. Además, podemos observar cómo los grupos de plantas B y C son característicos de las formaciones vegetales del norte (La Libertad, Lambayeque, Piura, y Tumbes), mientras que otras sabaneras como *Cercidium praecox* (A) se encuentran como reliquias en territorios del centro del Perú (Ica). También en la Tabla 1 nos encontramos con un gran paquete de cactáceas endémicas que delatan asociaciones fitosociológicas claramente definidas.

MATERIAL Y METODOS

Aunque de forma fisionómica, algunos autores han descrito ya las comunidades donde intervienen *Corryocactus brevistylus* y otros cactus más conocidos, como *Browningia candelaris* (Weberbauer 1912, 1945; Rauh 1958, 1979; Ferreyra 1987). Sin embargo, nosotros seguiremos el método fitosociológico de Braun-Blanquet (1964) ya que permite profundizar en el análisis y clasificación de los ecosistemas y además establecer una comparación ecológica, dinámica y geográfica con otras estructuras disyuntas (Moravec 1992).

RESULTADOS: ANALISIS FITOSOCIOLOGICO

I. Clase ***Opuntietea sphaericae*** *classis nova*
Typus: ***Oreocereo leucotrichi-Neoraimondietalia arequipensis*** *ordo novo*

Clase que reune a las formaciones de cactáceas de América del Sur. Elegimos como características de la clase a las dos especies que tienen una distribución más amplia. *Opuntia stricta*, desde el S de Estados Unidos a Uruguay, y *Opuntia sphaerica*, desde Perú a Argentina (Britton & Rose 1963; Hunt 1992).

Tabla 1.- Inventarios constituidos por listas de especies pertenecientes a diferentes puntos de las laderas andinas occidentales del Perú.

N. de inventario	I	II	III	IV	V	VI	VII	VIII	IX	
<u>Cactáceas endémicas</u>										
Cleistocactus acanthurus		+	+	+	+					4
Haageocereus multangularis		+	+	+	+					4
Haageocereus versicolor						+	+	+	+	4
Armatocereus procerus		+	+	+						3
Oreocereus piscoensis				+	+					2
Corryocactus aureus	+									1
Haageocereus platinospinus	+									1
Oreocereus tacnaensis	+									1
Trichocereus tacnaensis	+									1
Browningia icaensis		+								1
Corryocactus matucanensis					+					1
Corryocactus melaleucus					+					1
Espostoa melanostele					+					1
Haageocereus albispinus					+					1
Haageocereus limensis					+					1
Mila caespitosa					+					1
Mila nealeana					+					1
Weberbauerocereus churinensis					+					1
Haageocereus icosagonoides						+				1
Haageocereus pacalaensis						+				1
Browningia riosaniensis						+				1
Pilosocereus tuberculosus						+				1
Cleistocactus serpens							+			1
Espostoa blossfeldiorum							+			1
<u>Cactáceas de amplia distribución</u>										
Opuntia sphaerica	+	+	+	+	+					5
Neoraimondia arequipensis			+		+	+		+	+	5
Melocactus peruvianus					+	+	+	+	+	5
Opuntia quitensis						+	+	+	+	4
Echinopsis pachanoi					+	+	+			3
Opuntia pubescens							+	+	+	3
Espostoa lanata						+	+			2
Browningia candelaris	+									1
Corryocactus brevistylus	+									1
Oreocereus hempelianus	+									1
Oreocereus leucotrichus	+									1
Armatocereus matucanensis					+					1
Armatocereus cartwrightianus						+				1
Opuntia cylindrica							+			1

Tabla 1 (cont.).

N. de inventario		I	II	III	IV	V	VI	VII	VIII	IX	
Arbustos y árboles endémicos											
Jatropha macrantha		+	+	+	+	+	+				6
Cnidoscolus basiacanthus		+	+	+	+	+					5
Orthopterygium huaucui		+	+	+	+	+					5
Carica candicans		+	+	+	+	+					5
Furcraea occidentalis				+		+	+				3
Caesalpinia spinosa			+	+							2
Abutilon nigripunctulatum						+					1
Heliotropium adenogynum						+					1
Syncretocarpus sericeus						+					1
Arboles y arbustos de amplia distribución											
Cercidium praecox	A			+			+		+	+	4
Galvesia fruticosa					+	+		+		+	4
Colletia spinosissima		+	+	+							3
Kageneckia lanceolata			+	+		+					3
Trixis cacalioides				+	+	+					3
Cordia macrocephala						+			+	+	3
Prosopis pallida							+	+		+	3
Capparis scabrida							+	+		+	3
Capparis avicennifolia							+	+		+	3
Capparis crotonoides							+	+		+	3
Acacia macracantha	B						+	+		+	3
Cordia lutea							+	+		+	3
Grabowskia boerhaaviaefolia							+	+		+	3
Bursera graveolens							+		+	+	3
Capparis mollis							+		+	+	3
Ambrosia artemisioides		+	+								2
Encelia canescens						+		+			2
Pithecellobium excelsum							+			+	2
Eriotheca discolor	C						+			+	2
Maytenus octogona								+		+	2

Tabla 1 (cont.).

Táxones en 1 inventario. En II: *Proustia cuneifolia*; en III: *Hesperomeles pernettyoides*, *Cantua buxifolia*; en IV: *Ophryosporus pinifolius*, *Jungia spectabilis*, *Mutisia acuminata*; en V: *Ephedra americana*, *Croton ruizianus*, *Tarasa hornschuchiana*, *Abutilon reflexum*, *Lantana scabiosaeflora*, *Aloysia aloysioides*, *Lycium americanum*; en VI: *Vallesia glabra*; en VII: *Parkinsonia aculeata*; en IX: *Geoffroea striata*, *Caesalpinia paipai*, *Coccoloba ruiziana*, *Aeschynomene tumbezensis*, *Cordia peruviana*, *Cryptocarpus pyriformis*, *Bougainvillea peruviana*, *Piptadenia flava*, *Ipomoea carnea*.
Localidades: I-Dep. Tacna, valle del río Caplina; II-Dep. Ica, Nazca; III-Dep. Ica, valle del río Ingenio; IV-Dep. Ica, valle de Pisco; V-Dep. Lima, valle del Rimac; VI-Dep. Lambayeque, valle de Saña; VII-Dep. Piura, Piura; VIII-Dep. Piura, cerros de Amotape; IX-Dep. Tumbes, Tumbes.

\+ Orden ***Oreocereo leucotrichi-Neoraimondietalia arequipensis*** *ordo novo*
Typus: ***Corryocaction brevistyli*** *allianza nova*

Es el orden de las comunidades de cardonales andinos neotropicales.

Plantas características: *Armatocereus matucanensis*, *Carica candicans*, *Cnidoscolus basiacanthus*, *Jatropha macrantha*, *Melocactus peruvianus*, *Neoraimondia arequipensis*, *Oreocereus leucotrichus*, y *Orthopterygium huaucui*.

Las especies de cactáceas que proponemos como características del orden son las que tienen una mayor distribución en los Andes occidentales del Perú (Rauh, 1958; Ritter 1981; Zarucchi 1993). *Oreocereus leucotrichus* se encuentra en Bolivia, Chile, y Perú con una distribución bastante amplia, al menos altitudinalmente (2000 a 4000 m) [Ritter 1981; Hunt 1992]. También incluimos entre las características a algunos árboles y arbustos endémicos (McBride 1937, 1941, 1951; Brako 1993).

* Alianza ***Corryocaction brevistyli*** *allianza nova*
Typus: ***Oreocereo tacnaensis-Corryocactetum brevistyli*** *associatio nova*

Corryocactus brevistylus es una planta cuyo areal se extiende desde Arequipa (Perú) hasta Mamiña (Chile), y está presente tanto en el piso de *Browningia candelaris* (2000-3000 m) como en el nivel altitudinal siguiente, hasta 3500 m. En este último espacio convive con otras plantas propias de la puna seca peruano-chileno-boliviana, como *Diplostephium meyenii* o *Parastrephia lepidophylla*. La alianza *Corryocaction brevistyli* agrupa, por tanto también, a plantas características que tienen una distribución latitudinal semejante a *Corryocactus brevistylus* en el S del Perú y N de

Chile (Hoffmann 1989): *Ambrosia artemisioides*, *Browningia candelaris*, *Oreocereus hempelianus*. Sin embargo, altitudinalmente, la dividimos por el momento en dos asociaciones: 1- *Corryocacto aurei-Browningietum candelaris* y 2- *Oreocereo tacnaensis-Corryocactetum brevistyli*.

1- ***Corryocacto aurei-Browningietum candelaris*** *associatio nova* Typus: inventario 8, tabla 2.

Comunidades muy dispersas de cactáceas (5-10% de cobertura) cuya especie directriz es *Browningia candelaris*. Se trata de una biocenosis que se asienta sobre las laderas de derrubios cuarcíticos de los Andes occidentales, entre 2000 y 3000 m de altitud, y se extiende entre los departamentos de Arequipa y Tacna.

Características: *Browningia candelaris*, *Corryocactus aureus*, y *Haageocereus platinospinus*.

2- ***Oreocereo tacnaensis-Corryocactetum brevistyli*** *associatio nova* Typus: inventario 9, tabla 2.

. Al contrario que la asociación anterior, se trata de una comunidad bastante más densa (50-60% de cobertura) debido a la entrada de elementos de la puna seca, causada por un aumento de las precipitaciones, y a los sustratos más compactos. Altitudinalmente tiene su óptimo entre 3000 y 3500 m. Hasta el momento, restringimos su areal a los Andes del departamento de Tacna en función de la distribución de su especie diferencial, *Oreocereus tacnaensis* (Ritter 1981).

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Tabla 2.- Tabla fitosociológica con inventarios levantados en el valle del río Caplina (Dep. Tacna).

N. de inventario	1	2	3	4	5	6	7	8	9	10	
Area m^2	200	200	1000	1000	1	200	1000	1000	200	200	
Exposición	SW	W	W	W	-	S	E	E	S	S	
Altitud (Dm)	290	290	270	270	260	250	260	240	306	306	
<u>Corryocacto aurei-Browningietum candelaris-AS</u>											
Corryocactus aureus	+	1	1	1		1		1			6
Haageocereus platinospinus					+	2	2	2			4
<u>Oreocereo tacnaensis-Corryocactetum brevistyli-AS</u>											
Oreocereus tacnaensis									2	1	2
<u>Corryocaction brevistyli-AL</u>											
Corryocactus brevistylus	3	3	3	3		2	2	2	3	3	9
Ambrosia artemisioides	3	2	+	1	3		1	1	4	3	9
Oreocereus hempelianus	+	2	2	1		2	1		1	1	8
Browningia candelaris	+		1	1	2	1	2	2			7
<u>Oreocereo-Neoraimondietalia arequipensis-O, Opuntietea sphaericae-CL</u>											
Opuntia sphaerica	3	3	2	1	2	2	2	3	2	2	10
Oreocereus leucotrichus									1	2	2
<u>Compañeras</u>											
Atriplex atacamensis	1	+	+	+	1				1	1	7
Spergularia congestifolia			2	1	1	1	1	1			6
Quinchamalium procumbens		1		+	2	2		1	1		6
Cristaria multifida			+	+	+		1	1		+	6
Fagonia chilensis	+	+	+	+	1						5
Euphorbia tacnaensis	2	1							2	1	4
Villadia reniformis	2	2							2	1	4

<u>Compañeras en 1 ó 2 inventarios</u>. <u>En 1</u>: *Lycium distichum* +, *Ligaria cuneifolia* +, *Oxalis bulbigera* +; <u>en 3</u>: *Pellaea ternifolia* 1, *Nolana confinis* 1; <u>en 7</u>: *Nolana confinis* +; <u>en 8</u>: *Pellaea ternifolia* 1, *Notholaena nivea* 1; <u>en 9</u>: *Balbisia meyeniana* 3, *Parastrephia lepidophylla* 1, *Chersodoma arequipensis* 1, *Spergularia collina* 2, *Diplostephium meyenii* 2, *Ephedra americana* +, *Proustia berberidifolia* 1, *Gochnatia arequipensis* 1; <u>en 10</u>: *Balbisia meyeniana* 2, *Parastrephia lepidophylla* 1, *Spergularia collina* 1, *Diplostephium meyenii* 1, *Gochnatia arequipensis* 1.

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THE REORGANIZATION OF THE ACADEMIES OF SCIENCES OF THE FORMER SOVIET UNION WITH EMPHASIS ON THE UKRAINIAN ACADEMY

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ABSTRACT

The Academies of Sciences of the new republics organized from the former Soviet Union (USSR) are reviewed for their current status and discipline interests. Some of the largest and oldest academic institutes in the world are found within the former USSR framework. These institutes include research laboratories, herbaria, and agricultural centers representing disciplines of the plant sciences. New institutes organized since the dissolution of the USSR are also included. Names of noted scientists are incorporated into the titles of some of these academic centers. All areas of science and engineering, including the botanical sciences, are briefly presented in this review of the Commonwealth of Independent States (CIS) Academies as they now exist.

KEY WORDS: USSR-CIS Academies of Sciences, laboratories, institutes, research centers, academic disciplines of the Academies, the Ukraine Academy

Since the recent formation of the independent republics, created out of the former Soviet Union, the Academies of Sciences facilities within each republic have continued to function independently. Laboratories, institutes, and research centers produce research projects with quality data from in-depth studies. Many thousands of professional and highly trained individuals are employed in these facilities. The majority of their findings are presented as journal articles, reports, lectures, and symposia within their institutes. Good working relations exist between the Soviet Academies and European based science organizations, particularly in Finland, Germany, and England. Academies are now organized within separate republics, utilizing the previous Soviet Union administrative and scientific personnel. Since the formation of the republics, the Academies have actually expanded their operations and academic disciplines. There is also a newly organized Russian Academy of Sciences

housed in new Moscow facilities intended for use by the entire former USSR Academies of Sciences (Figure 1). Individual Academies are examined according to their research specialties in the new republics with emphasis given to the detailed structure of the Academy of Sciences of the Ukraine.

Prior to the formation of the independent republics, the headquarters for all institutes, sections, and laboratories of the Academy of Sciences of the Soviet Union was Moscow. One Academy existed with many individual and corresponding members located throughout the previous Soviet Union. The central offices for the Soviet Union were housed in the former palace and support building used by Napoleon on his march through central Europe (Figure 2). A new Academy building was constructed in Moscow to house the central offices of the ever expanding institutes and research facilities of the Soviet Union (Figure 3). This building brings to the Moscow skyline an ultra modern multisection structure of an architectural design unique to Moscow (Figure 4). Completed just before the Soviet dissolution, the new building complex was constructed near the Yuri Alekseyevich Gagarin Memorial and the Gagarin Plaza. With the dissolution of the Soviet Union, the new building now is headquarters for the reorganized Russian Academy of Sciences. Also included in the building are conference rooms, reception halls, and auditoriums in addition to administrative office suites for science, cultural, and engineering disciplines.

. Now the republics have independent Academies of Sciences and corresponding administrative offices. The independent Academies of Sciences and capital cities include the Academies of Azerbaijan (Baku), Armenia (Yerevan), Belarus (Minsk), Estonia (Tallinn), Georgia (Tbilisi), Kazakhstan (Alma-Ata), Krgyzstan (Bishkek), Latvia (Riga), Lithuania (Vilnius), Moldova (Kishinyov), Russia (Moscow), Tajikistan (Dushanbe), Turkmenistan (Ashkhabad), Uzbekistan (Tashkent), and the Far East and Ural Scientific Center Section in addition to the Ukraine (Kiev).

The Academy of Sciences of Azerbaijan was founded in the capital city Baku in 1945 on the basis of the Azerbaijan Branch of the Academy of Sciences of the USSR. The Academy has 47 full members and 46 corresponding members that comprise the voting personnel found in five sections and 30 scientific establishments and facilities. Noted areas of specialization include mathematics, hydrodynamics, physics of semi-conductors, electrophysics, the chemistry of oil, geology, physiology, biochemistry, and other closely related fields, with the biological sciences receiving less attention.

The Academy of Sciences of Armenia was founded in 1943 in Yerevan. Individual membership includes 40 members with 50 corresponding members and three foreign members in six sections and 30 scientific establishments. Noted scientific disciplines include mathematics, cybernetics, astrophysics, mechanics of solid bodies, geology, seismology, the chemistry of natural and synthetic compounds, biochemistry, and archaeology.

The Academy of Sciences of Belarus with headquarters in Minsk was organized in 1928 on the basis of the Belarus culture. The organization was initiated with nine research institutes and three independent labs. After World War II (the Great Patriotic War), many scientific enterprises were developed and incorporated into the Academy. There are approximately 53 members, 75 corresponding members in five branches and 32 scientific establishments. Scientific disciplines of particular note include solid physics, high temperature optics physics, nuclear engineering, computer devices,

cybernetics, radiobiology and photosynthesis, economics, philosophy, and linguistics.

The Academy of Sciences of Estonia was founded in 1946, after the Great Patriotic War. The Academy has 21 members, 24 corresponding members, and ten research establishments. The complex use of slate fuel is a major research discipline of study.

In the city of Tbilisi, the Academy of Sciences of Georgia was founded in 1941. There are 63 academy members, 69 corresponding members in nine sections and 41 scientific establishments. Over 1000 scientific topics and 234 science problems are under study.

The city of Alma-Ata was the founding location for the Academy of Sciences of Kazakhstan in 1946. There are 53 members of the Academy, 85 corresponding members with five branches, 42 research establishments, and sixteen institutes. With a staff of over 1800 members, 48 hold Ph.D. degrees, 238 M.S. degrees, 200 assistants, and over 200 are graduates of the institutes.

In Bishkek the Academy of Sciences of Kyrgyzstan was organized in 1954. A total of 26 members and 32 corresponding members form the entire membership. Five sections and seventeen scientific establishments are found in the Kyrgyzstan Academy. Trends of study in the Academy include developmental geology, physics, and geochemistry of mountain rocks.

The Academy of Sciences of Latvia was organized in Riga in 1946. The Latvia Academy has 25 academy members and 31 corresponding members. There are three sections and fifteen scientific establishments. The guidelines of the Academy examine the national economy and the culture of the republic.

The Academy of Sciences of Lithuania was founded in Vilnius in 1941, and restored in 1946. The Academy now has 23 members and 25 corresponding members in three branches and twelve scientific establishments. Research trends include theories of probabilities, statistics, problems of cybernetics, theoretical spectroscopy of atoms and molecules, physics of semi-conductors, high temperature heat physics, metal coatings, and galvanic covers with previously set properties. Biological principles to increase plant growth along with economics are under study as are the disciplines of history, languages, and literature.

The Academy of Sciences of Moldova was founded in 1961 in Kishinyov. The eighteen members and 26 corresponding members are found in three branches and seventeen scientific establishments. The primary research trends are directed to solving problems of agriculture to increase production. The history and culture of Moldova are also under study.

The Academy of Sciences of Russia was reorganized in 1991. First founded in 1917, then in 1925, the organization was expanded into the Academy of Sciences of the U.S.S.R. Before 1917, the group was known as the St. Petersburg Academy of Sciences which was initially founded in 1724. From 1934 to 1991 the Academy was housed in Moscow. There are approximately 269 members, 536 corresponding members, and 77 foreign members.

The U.S.S.R. Academy of Sciences had several sections. These sections included mathematics, general physics and astronomy, nuclear physics, physico-mechanical problems of mechanical engineering, mechanics and process of management, general and technical chemistry, physicochemistry and technology of inorganic materials, biochemistry, biophysics, and chemistry of biologically active compounds, physiology, general biology, geology, geophysics and geochemistry, oceanology, physics of the atmosphere, geography, history, philosophy and law, economics, literature, and language.

The Soviet complex included 250 scientific establishments, with about 42,000 science workers, 200 scientific councils, and a research fleet. It coordinated the activities of the Academy of Sciences of the Union Republics. The complex trained the research staff. Included were 16,500 postgraduates located throughout the Union Republics. Under the Union Republics, organized through Moscow, the Union Academies awarded medals and prizes for science works. Also coordinated through Moscow were a number of Science Societies within the Academy of Sciences of the former U.S.S.R. The Soviet Academy also handled scientific relations with 250 international organizations located in many countries.

The Academy of Sciences of Tajikistan was organized in 1951 in Dushanbe. The disciplines and sections of the Academy include mathematics, seismology, astrophysics, nuclear physics, chemical technology, biology as well as history and literature. The number of members in Tajikistan is not known.

The Academy of Sciences of Turkmenistan was organized in 1951 in Ashkhabad. Research specialties include molecular acoustics, spectroscopy, applied geophysics, petroleum chemistry, desert farming, cotton productivity, biochemistry of viruses as well as history of the area, languages, and literature. The number of members in Turkmenistan is not known.

The Academy of Sciences of Uzbekistan was founded in 1932 in Tashkent on the basis of a republic committee guided by the Soviet science establishments. Regular meetings and the Academy structure were developed by 1940. The number of members in Uzbekistan is not known. In addition, the Siberian section and the Far East and Ural Scientific Center contain eleven branches, including five in Siberia.

The Academy of Sciences of the Ukraine was founded in 1918 by a group in Kiev headed by Academician Vernadsky who served as the first president. Succeeding presidents included Acad. Vasilenko (1921-22), Acad. Levitsky (1922), Acad. Lipsky (1922-28), Acad. Zabolotny (1928-29), and Acad. Bogomoletz (1930-46). From 1946 to 1991 the Academy directorate was through offices in Moscow. Currently the Ukraine Academy has 83 Academy buildings or complexes, 87 organizations and departments, with 89,000 people working within the structure of the Academy. A total of 2096 people have earned their Ph.D. degrees, 10,336 have M.S. degrees, 10,003 people are professor - candidates of science, and 194 are academicians and 269 corresponding members of the Academy of Sciences. Of the 2096 Ph.D.'s 2050 work within the science establishments. Currently 54 foreign member belong to the Ukraine Academy.

The general management of the Ukraine Academy is structured for an office of the president, with a vice president, general science secretary, and assistant science secretary reporting to the president. The vice president's immediate staff includes a group manager, a special task group, a group for equipment computation and science instruments, and a group for plans, operations, and economics. In addition, special departments are designed to report directly to the president and vice president. The special departments include the Dept. of Science Organization, Dept. of Building, Dept. of International Regulations, and the Dept. of Applied Programs.

Major sections in the Ukraine Academy serve as the disciplinary areas of investigation and research. The areas of study evolved to fit the needs of the people and geographic location of the Ukraine. The research centers of the National Academy include the Innovation Center, Donetsk Research Center, West Research Center, South Research Center, North-Eastern Research Center, and the Research Center of the Dnieper Area. In comparing section topics between republics of the former Soviet Union, similarities are found when the Union was directed previously from Moscow. Additional disciplines identify the needs and requirements of a particular geographic location and more recently the requirements and ethnic background of a particular group of people. Frequently these divisions are also separated by a particular language and cultural heritage. The Academy of Sciences of the Ukraine strongly reflects these regional and ethnic characteristics and requirements.

The central departments of the Ukraine Presidium include Metrology, Standardization, and Quality Production Control, with an Experimental Plant of the Institute of Superhard Materials. The Center of Research and Teaching Foreign Languages is becoming more widely used with the creation of the CIS. Departments include Material and Technical Supply, and Scientific Equipment. The extensive Natural Science Museum houses Archaeology, Geology, Paleontology, Zoology, and Botany Museums and herbaria. The Science Exposition Center, Science Exhibition Center, and Intertrade Firm help promote science information as does the Laboratory of Scientific Cinema - Photoinformation, House of Scientists, the Association of Young Scientists and Specialists, and individuals in their respective disciplines.

Interdepartmental Research Councils in the Ukraine focus attention on Socioeconomic Prognostication, Economics, Increase of Safety and Longevity of Machines and Structures, Corrosion and Anticorrosive Protection of Metals, and Problems of National Relations. Other Councils focus on Automation of Experimental Studies, Experimental Instrument Making, Problems of Biosphere, Philosophical and Social Problems of Science and Engineering, Problems of Biotechnology, and the Automated Systems of Data and Computer Networks, Science Publications, Museum, Information - Library, and the Council on Mechanics and Technology of Explosion. Committees are organized for Slavonic Scholars, Studies and Expansion of Slavonic Cultures, the Program of UNESCO's Man and Biosphere, New and Regenerated Sources of Energy and Its Conservation, Chemical Problems, Scientific Terminology, Informatics, System Analysis, and the Committee of Science and Culture Relations with Ukrainians Abroad. Commissions include Space Research, Transport Development, World Oceans, Relations with the International Agency on Atomic Energy, Program on Goods and Services, Agricultural Sciences, Computer Engineering, Distribution and Use of Scientific Services and Installations,

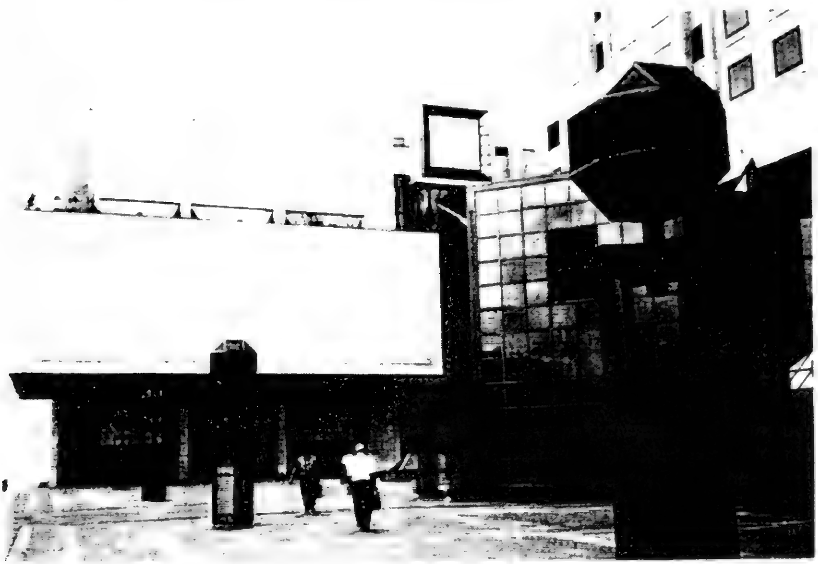

Fig. 1. Main entrance to the new Academy of Sciences of Russia in Moscow.

Fig. 2. Headquarters of the former Soviet Academy of Sciences, Moscow.

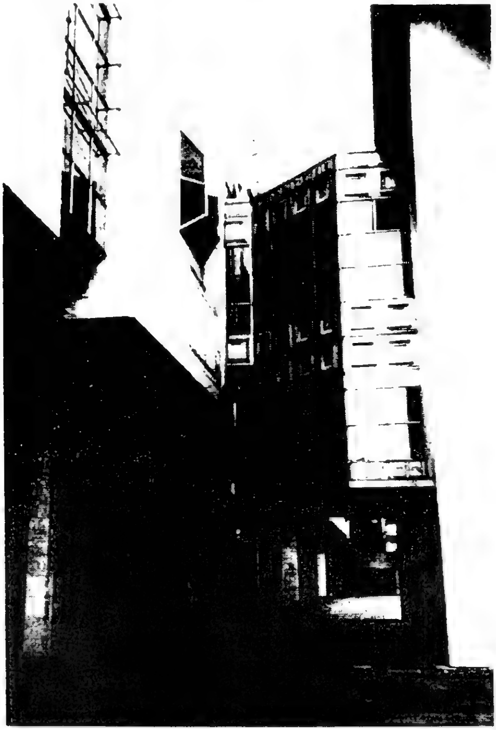

Fig. 3.

Complex of offices, lecture rooms and conference facilities at the Russian Academy of Sciences, Moscow.

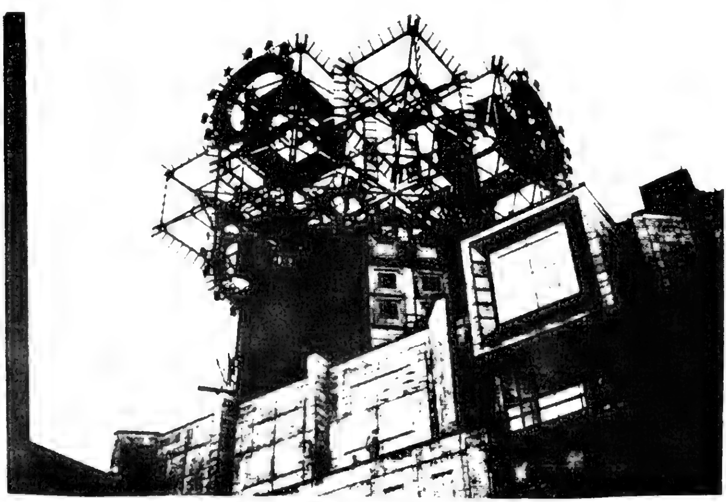

Fig. 4

Art sculpture located on high rise office complex of the Russian Academy of Sciences, Moscow.

Acquirement of Archive Materials, Works of Art and Rare Publications, Youth Relations, Military Sponsorship, Science Historians, Awards for the Use of Inventions, and the Commission on Development of Scientific Inheritance.

In addition to the Presidium organization, two major sections compose the National Academy of Sciences of the Ukraine. Centers, Institutes, Bureaus, and Associations are established in Section I, the Mathematics section of the Academy. Institute disciplines include Applied Problems of Mathematics and Mechanics, Low Temperatures, while Mathematical Societies exist in Kharkiv, Kiev, Lviv, and Donetsk. A total of eleven sections are found in Section I. Internationally recognized people honored with their names incorporated into the Institute names in Section I include Ya. S. Pidstrygach (Applied Math. and Mechanics), and B.I. Verkin (Low Temperatures).

Section II includes Science Information, Computer Engineering, and Automation. Twelve establishments in Section II include Cybernetics, Timer Computers, Aerospace Information of Ecological Monitoring, Automated Biotechnical Systems, Problems of Calculating Machines and Systems, Program Systems, Problems of Record Information, Science and Technology Potential, Applied Information, Technology of Programming, Problems of Artificial Intelligence, Automation, Experimental Production Amalgamation, Informatics and Control, and Problems of Cybernetics. Institutes so honored by names of scientists include V.M. Glushkov (Cybernetics) and G.M. Dobrov (History of Science).

Mechanics Institutes are found in Section III of the Academy complex. The Institutes include Design Technology, Technical Mechanics, Problems of Strength, Geotechnical Mechanics, Physicotechnical Problems of Transport on Superconducting Magnets, Hydromechanics, and Deformed Solid Body Mechanics.

Twenty three Institutes, Pilot Plants or Research Centers are within Section IV Physics and Astronomy. Major facilities include Nuclear Physics, Semiconductors, Metal Physics, Theoretical Physics, Low Temperature Physics, Radiophysics and Electronics, Radioastronomy, the Ionosphere, Condensed Systems, Applied Physics, Electron Physics, Electrophysical Treatment, Solid Body Physics, Quantum Electronics, Astronomy, Plasma Electronics, and Acceleration of Charged Particles.

Eight Institutes and Pilot Plants are housed in Section V Earth Sciences. They include Geological Sciences, Marine Geology, Geophysics, Geodynamics of Explosion, Geography, Geochemistry, Mineralogy and Ore Formation, Fossil Fuels, Nature Conservancy, Marine Hydrophysics, and Natural Shelf Resources. Councils and Committees are on Geophysics, Meteorites, Lithology, Mineralogy, Paleontology, Hydrogeology, Natural Resources - Remote Sensing, Mineral Resources, Tectonics, Fossil Fuels, and Earthquakes. An Institute is named in honor of S.E. Subbotin (Geophysics).

Physical and Technical Problems of Materials Sciences compose the Institutes of Section VI. The Institutes and Pilot Plants include Electrical Welding, Metal Treatment, Welding Materials, Electrometallurgy, Material Science Problems, Basalt Fibers, Materials Science Steels, Materials Science Problems, Casting Problems, Corrosion Mechanics, Superhard Materials, Pulse Processes and Technologies, Single Crystals, Thermoelectrics, and Ferrous Metallurgy. The Councils focus attention on

Problems of Superficial Phenomena in Melts and Solid Phases, Physical and Chemical Mechanics of Materials, and Problems in High Pressures in Materials Science. Institutes to honor scientists in Section VI include E.O. Paton (Electrical Welding), I.M. Frantsevich (Materials Science), G.V. Karpenko (Physical and Mechanical Science), V.M. Bakul (Super Hard Materials), and Z.I. Nekrasov (Ferrous Metallurgy).

Section VII of the Academy contains Institutes and Pilot Plants in Physical and Technical Problems of Power Engineering. Disciplines of Institutes, Pilot Plants, Bureaus, and Councils include Thermal Physics, Mechanical Engineering, Electrodynamics, Simulation Problems in Power Engineering, Energy Conservation, High Temperature Transformation, Gas, Steam Engines, Low Grade Fuels, and Mining Thermal Physics.

Section VIII Institutes, Pilot Plants, and Councils of the Academy involve disciplines of Chemistry. The designated areas of chemistry are Physical Chemistry, Technology of Fossil Fuels, Organic Chemistry, High Molecular Weight Compounds, Carbon Chemistry, Colloid Chemistry and Chemistry of Water, Surface Chemistry, Bio-organic Chemistry, and Petroleum Chemistry, Sorption and Problems of Endoecology, Drugs and the Ministry of Health, and Biocolloid Chemistry. Scientific Councils are organized to examine the Problems in Chemical Kinetics and Structure, Electrochemical Kinetics and Electrode Processes, Synthesis and Ultrapurification of Inorganic Compounds, Modification of Polymers, Technology of Surface Modification, Biopolymers and Bioregulators, and Petroleum Chemistry and Refining. Institutes in Section VIII bearing names of noted chemists include L.V. Pisarzhevsky (Physical Chemistry), O.V. Bogatsky (Physical Chemistry), L.M. Litvinenko (Organic Chemistry), and A.V. Dumansky (Colloid Chemistry).

Section IX Biochemistry, Physiology, and Molecular Biology contains institutes in these three disciplines in addition to Microbiology and Virology, and Cryobiology and Cryomedicine along with five Scientific Councils in Problems in these study areas. Institutes named for noted scientists include O.V. Paladin (Biochemistry), O.O. Bogomolets (Physiology), D.K. Zabolotny (Microbiology and Virology), and I.P. Pavlov (Physiology).

Section X Problems in Medicine is organized into Institutes, Bureaus, Hospitals, and facilities for making instruments and equipment. Institutes include Experimental Pathology, Oncology and Radiobiology, Labor Medicine, Neurosurgery, Urology and Nephrology, Endocrinology and Metabolism, Radiation Medicine, Epidemiology and Radiation Damages Treatment, and Food Chemistry and Technology. Two Councils examine Problems in Malignant Tumors and Deterioration. A scientist professionally recognized in Section X with an Institute name is R.E. Kavetsky (Pathology, Oncology, and Radiobiology).

The vast Section XI on General Biology houses Institutes, Botanical Gardens, Natural Reserves, Museums, and Societies that define the different regions and various habitats of the land. Institutes include Botany, Carpathian Ecology, Zoology, Hydrobiology, Plant Physiology and Genetics, and Biology of the Southern Seas. Natural Reserves, Museums, and Science Societies are found throughout the country, specializing in many disciplines. Science Councils focus on Problems in Ecological Prognostication under conditions of Intensive Conservancy, and Animal

Conservancy. Scientists elevated to Institute Recognition in Section XI include M.G. Kholodny (Botany), M.M. Gryshko (Botany), I.I. Schmalhausen (Zoology), and O.O. Kovalevsky (Tropical Biology).

Section XII Economics includes institutes in Economics, Problems of Markets and Economicoecological Research, Industrial Economics, Economicolegislative Research, Economics and International Relations, and Economical Programs. Councils exist to Investigate Production, Population Employment of Job Markets, Problems of Economic Relations and Improvement of Economic Mechanism, and Improvement of Planning and Social Production Control.

Section XIII includes History, Philosophy, and Law. Institutes of the Section include Ukraine History, Archaeology, Ukraine Science, Science of the East, National Relations and Political Science, Philosophy, Sociology, and the State and Law. Various Centers, Museums, Libraries, and Associations are found throughout the country. Councils focus attention on Problems in History of Science, Sociology, Coordination of Legislative Research, and Archaeology and Ancient History.

Section XIV concerns Literature, Language, and Art. Institutes include Literature of the Ukraine, Linguistics, Ukrainian Language, Art Study, Folklore and Ethnography, and Peoples Science. Councils study Scientific Terminology, Classical Inheritance and Fiction of the Present, Regularities in Development of Languages and Practice of Linguistic Activity, Artistic and Traditional Everyday Culture, the School of Ukrainistics, and the Ukrainian Onomastic Commission. Institutes with names of prominent individuals include T.H. Shevchenko (Literature), O.O. Potebnya (Linguistics), and M.T. Rylsky (Art).

Internationally recognized scholars are honorea by having their names attached to the various Institutes. A time of transition is now underway with all Institutes under the former direction of central Academy control in Moscow. Now the Academy in Moscow is the directive for Russia, and Commonwealth States have independent jurisdiction for each new commonwealth republic. New associations replace the Soviet system, but as one nation dissolved into many, the entire fabric of the new republics must be built that incorporates the traditions, customs, and languages of the regions of the former U.S.S.R. International trade is suddenly crippled, and new economies and associations must be fostered. Central government funding, salaries, equipment, and supplies now are shifted to the private sector, international foundations, and associations. During this transition, the Institutes with their staff members remain available to supervise and guide the transition to individual Commonwealth States, a stabilizing factor for nationality expression. Every procedure, new invention, method, and association is now a new experience in an entirely new set of values and in an entirely new way of life which has no infrastructure to replace the old Soviet system.

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MAMMILLARIA LUETHYI (CACTACEAE), A NEW SPECIES FROM COAHUILA, MEXICO

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ABSTRACT

A new species of *Mammillaria*, ***M. luethyi*** G.S. Hinton is described from northern Coahuila, México, where it occurs in shallow soil deposits on horizontal limestone slabs. It is outstanding for its unique spine characters.

KEY WORDS: Cactaceae, *Mammillaria*, México, Coahuila, systematics

With the following description we put an end to a 44 year old mystery. Originally the plant herein described was found in 1952 by Boke as a cultivated specimen of unknown origin. Photographs made by Cutak were published by Backeberg (1961) who wrongly identified it as an undescribed species of *Neogomesia*. Glass & Foster (1978) showed the same plant, identifying it correctly as a species of *Mammillaria*. Bravo & Sanchez-Mejorada (1991, figure 242) published the same photo as *Normanbokea valdeziana*.

MAMMILLARIA LUETHYI G.S. Hinton, *spec. nov.* TYPE: MEXICO. Northern Coahuila: On limestone slabs in Chihuahuan Desert vegetation, May 19 1996, *Hinton et al. 25771* (HOLOTYPE: HERBARIUM OF G.B. HINTON; Isotypes: to be distributed).

Plantulae perpusillae, spinis albis dense vestitis, vix e terra emergentes, simplices vel modice prolificantes, apice 1.5 cm diametro, radicibus succulentis e base caulis, tuberculis peranguste cylindricis, erectis, ca. 5.5 mm longis, 1.3 mm diametro, areolis 80 spinis albis, dense insertis, 0.4-0.6 mm longis, extremo solo pubescentibus papillis radiantibus quasi stellula, apicem tuberculi tegentibus. Flos 2 cm longus et diametro, submagenteus. Fructus globosus, ca. 4.5 mm diametro, vix carnosus, immersus in caule, luteolus ad modice rubescens. Semen niger, globosus, 1 mm diametro, hilo basali, testa foveolata.

Figure 1. Photograph of habit and habitat of *Mammillaria luethyi*.

Stems single to branching with up to 7 heads, apex rounded to flattened, ca. 1.5 cm in diameter, emerging only slightly above the substrate. Subterranean part of the stem naked, carrot-like, conical with several strongly succulent, tapering roots, ca. 6 mm in diameter at base. Tubercles ascending, densely set, very slender, cylindrical, up to 5.5 mm long and 1.3 mm in diameter, dark green with a reddish or whitish base, becoming dry and deciduous in the subterranean part of the stem. Areoles containing some hyaline hairs and up to 80 white spines, densely set in various series, porrect to radiating, forming a dense flattened cluster 1.3-1.8 mm in diameter, slightly rhomboidal in outline, completely covering the apex of the tubercle. Spines 0.4-0.6 mm long, the uppermost in the areoles slightly longer, whitish-translucent with hyaline hairs in the uppermost part, hairs radiating and forming a little umbrella at the spine apex. Flowers up to 2 cm long and wide, light magenta. Fruit nearly completely sunken in the stem, globular, 4.5 mm in diameter, yellowish green to reddish green with up to 15 seeds, drying and leaving a cavity filled with seeds in the stem base. Seeds black, globular, ca. 1 mm long and wide, with a basal hilum, slightly separated by a faint neck, irregularly oval, 0.8 mm long and 0.4 mm wide. Testa finely pitted.

The plants grow on horizontal limestone slabs, deeply sunken in a very shallow substrate (Figure 1), only 1.5-2.0 cm deep, of sandy clay and fine gravel, growing with *Selaginella wrightii, Neolloydia conoidea, Bouteloua gracilis*, and lichen. The microhabitats are surrounded by typical Chihuahuan Desert vegetation, dominated by *Agave lechuguilla, Dasylirion* sp., *Yucca elata, Yucca* sp., *Fouquieria splendens, Escobaria tuberculosa*, and *Glandulicactus uncinatus*.

Mammillaria luethyi is known only from the type locality, which has been purposefully withheld to protect the habitat from collecting. The exact locality data are deposited with the holotype.

Mammillaria luethyi belongs to the series *Herrerae*, together with *M. humboltii, M. herrerae, M. albiflora*, and *M. sanchez-mejoradae*, this last being its closest neighbor, growing to the southeast in Nuevo León. The species of series *Herrerae* share several characters, *e.g.*, fruits sunken in the stem, a high number of white radial spines, lack of central spines and the distribution as narrow endemics on limestone rock in eastern México from Querétaro to Coahuila (Lüthy 1995). *Mammillaria luethyi* differs from *M. sanchez-mejoradae* in the arrangement and vestiture of the spines (vs. pectinate, plumose) and the color of the flower (vs. white). Superficially it resembles *M. saboae*, of series *Longiflorae*, from which it differs in the habitat (vs. volcanic rock), spine insertion, count, length, and vestiture (vs. a single series, 17-25, ca. 2 mm long, glabrous) and flower size (vs. 4 cm long and wide).

This remarkable *Mammillaria* is named for Jonas M. Lüthy, one of its co-discoverers, a Swiss botanist and student of the genus *Mammillaria*, who after a flash of intuition pointed to its exact location on his map and spoke, "This is where the plant grows." And there we found it.

ACKNOWLEDGMENTS

I wish to thank my wife Alejandra for her support on all my collecting trips.

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TURBINICARPUS BOOLEANUS (CACTACEAE), A NEW SPECIES FROM NUEVO LEON, MEXICO

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ABSTRACT

A new species of *Turbinicarpus*, ***T. booleanus*** G.S. Hinton, is described from Nuevo León, México, where it occurs on gypsum outcrops. A map showing the distribution of the new species and the other tuberous-rooted taxa of *Turbinicarpus*, *T. mandragora*, and *T. subterraneus* var. *subterraneus*, is also provided.

KEY WORDS: Cactaceae, *Turbinicarpus*, México, Nuevo León, gypsum, systematics

Some species of *Turbinicarpus* (Backeb.) Buxb. & Backeb. occur consistently throughout the gypsum outcrops in Nuevo León, México. The gypsophilic species are usually like those that were once included in the genus *Gymnocactus* Backeb., a remarkable exception being the recently described *T. hoferi* J. Lüthy & A.B. Lau from the gypsum to the north of Aramberri, Nuevo León. Like other genera with gypsophilic members in this area, notably *Leucophyllum, Verbesina, Sedum, Aztekium, Geohintonia, Jaimehintonia,* and *Sophora, Turbinicarpus* contains narrowly endemic taxa which are often restricted to a single gypsum outcrop. The present novelty occurs in the Municipio of Galeana, in two localities separated a few kilometers from each other.

TURBINICARPUS BOOLEANUS G.S. Hinton, *spec. nov.* TYPE: MEXICO. Nuevo León: Mpio. Galeana, Y Griega, 1860 m, gypsum hillside, 1 Mar 1992, *Hinton et al. 21805* (HOLOTYPE: TEX; Isotypes: CANTE,ENCB, G.B. Hinton Herbarium).

Turbinicarpus mandragora (A. Berger) A.D. Zimmermann et *T. subterraneus* (Backeb.) A.D. Zimmermann var. *subterraneus* simile quoad radix tuberascens per collum gracilem ad caule connexa; caulibus singulis partim hypogaeis depressi-obovatis; collo hypogaeo plerumque 2-5 cm longo; in quoque areola spinis centralis duabus, superiore antrorsa inferiore porrecta,

ad basim albis cetero atrobrunneis vel nigris; spinis radialis vulgo 18-20 ubique albis vel apicem versus rubris vel brunneis; floribus magenteis; fructibus longitudinaliter dehiscentibus pulverulentis, squamis duabus stramineis ca. 1 mm longis.

Stems single, rarely branching, broadly obovate, 2.5-4.5 cm high, 2.5-5.5 cm in diameter, basally truncate in older specimens. Roots connected to the stem by a narrow, hypogeous neck; neck 1-5 cm long, 3-5 mm in diameter, usually straight but occasionally curved or angled. Roots tuberous, pyriform to globose, 0.8-2.8 cm in diameter, 1.2-5.7 cm long. Stems tuberculate, the axils naked; tubercles rhomboidal in cross section, lacking a dorsal sulcus, green, white-dotted, ca. 4 mm high, ca. 5 mm wide at the base, arranged in 13 and 21 spirals. Areoles elliptical 1.5-2.0 mm long, 1 mm wide, villous near apex, later glabrous, ca. 8 mm apart. Central spines 2, ca. 0.3 mm in diameter at the base, terete, proximally white, turning brown, then black above, the apical antrorse, mostly 12-15 mm long, ranging from 10 to 24 mm, the basal porrect, mostly 12-18 mm long, ranging from 10 to 21 mm. Radial spines mostly 18 to 20, rarely as few as 14 or as many as 28, acicular, white, the extreme apex usually brown or reddish; the lowermost (retrorse) radial spines shortest, these ca. 3-6 mm long and 0.1 mm in diameter at the base, progressively longer above, the uppermost (antrorse) radial spines longest, usually ca. 17 mm, rarely to ca. 29 mm long, 0.2 mm in diameter at the base. Flowers ca. 2 cm in diameter, ca. 2.5 cm high. Outer perianth segments oblong, entire, mucronulate, the lowermost ca. 8 mm long and 3 mm wide, with a white, translucent margin, midvein green, becoming dark purple above. Inner perianth segments narrowly oblanceolate, apex emarginate and often mucronulate, ca. 15 mm long and 4 mm wide, pale to dark magenta with darker midvein. Anthers yellow; filaments yellow. Style ca. 11 mm long; stigma lobes 7 to 9, pale yellow, protruding ca. 5 mm above the anthers. Fruit dark green to purple, pulverulent, longitudinally dehiscent, ca. 6 mm in diameter and 7 mm high, attached at the base of an apical areole, with two stramineous scales ca. 1 mm long.

In the treatments of both Anderson (1986) and Bravo *et al.* (1991), *Turbinicarpus booleanus* will key to *T. mandragora* (A. Berger) A.D. Zimmermann and *T. subterraneus* (Backeb.) A.D. Zimmermann var. *subterraneus* because of their tuberous roots connected to the stem by an elongate neck. These three taxa are widely separated geographically (Map 1). *Turbinicarpus booleanus* is unique among them in having only about a third of the main stem body above ground; this correlates with the porrect central spines which are directed vertically. In the length of its neck, *T. booleanus* is more similar to *T. mandragora*, but the latter has a more or less globose, epigeous body; brown-tipped (vs. mostly black) central spines that spread perpendicularly away from the body; fewer radial spines per areole (8 to 14 vs. 14 to 28); and white (vs. magenta) flowers. This species is known only from its type locality, near Parras, in southern Coahuila. Though closer geographically to *T. subterraneus* var. *subterraneus*, *T. booleanus* is easily distinguished from this taxon by its shorter, thicker, hypogeous neck with partially hypogeous body; and more and longer radial spines that are brown at the apex (vs. glassy-white throughout). *Turbinicarpus subterraneus* var. *subterraneus* grows about 75 km to the south of *T. booleanus* on low shrubby limestone hills with *Agave, Dasylirion, Flourensia, Larrea, Mortonia*, and *Yucca*, the plants incredibly suspended on their long necks. *Turbinicarpus booleanus* is found infrequently only on bare, exposed gypsum slopes with *Dasylirion berlandieri, Muhlenbergia gypsophila, Pinus greggii, Selaginella gypsophila*, and *Yucca decipiens*.

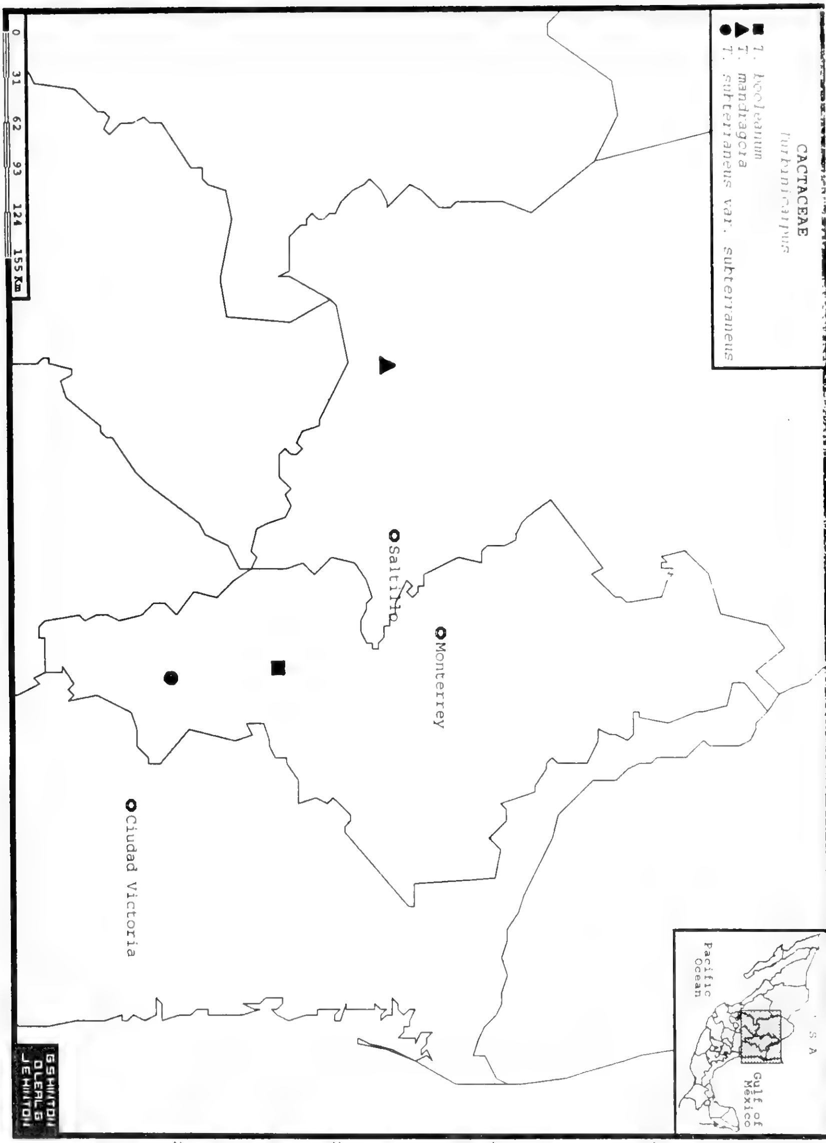

Figure 1: Map of the distributions of *Turbinicarpus booleanus*, *T. subterraneus* var. *subterraneus*, and *T. mandragora*.

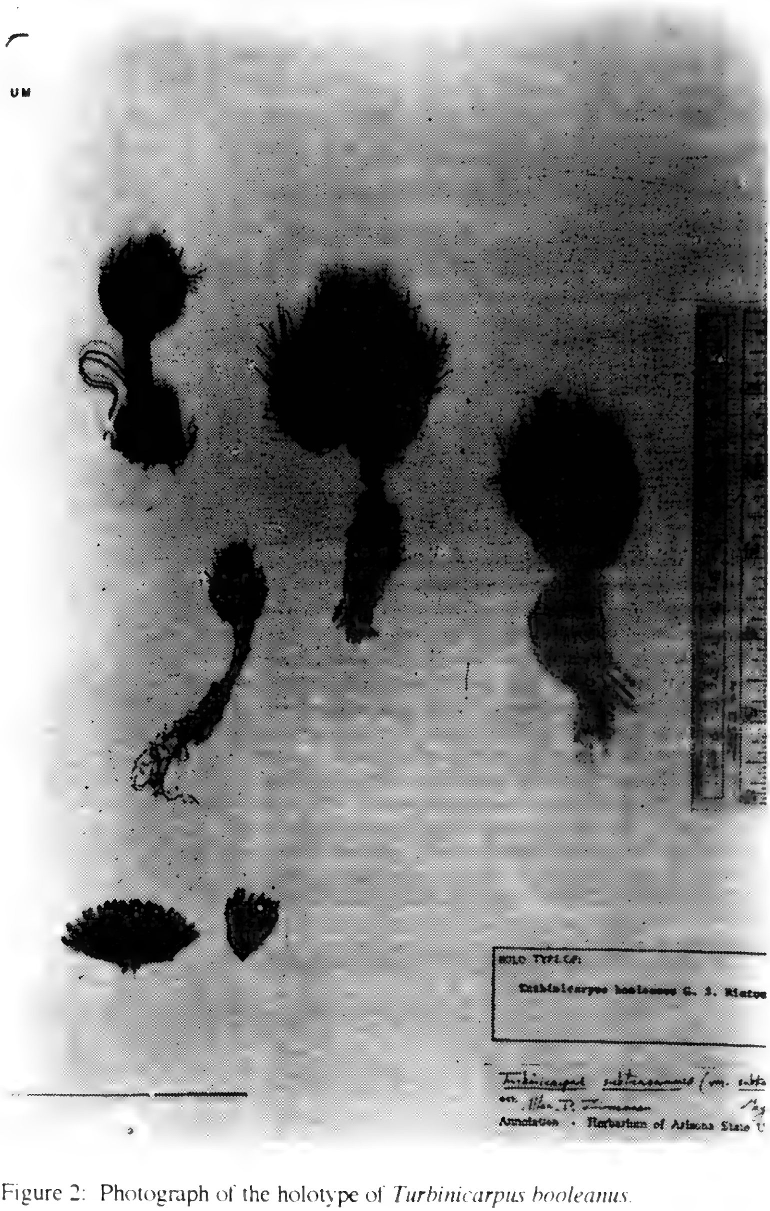

Figure 2: Photograph of the holotype of *Turbinicarpus booleanus*.

It is a pleasure to name this novelty for my son George Boole, who, though only five years old, accompanies me regularly on my field trips throughout Nuevo León and Coahuila.

ACKNOWLEDGMENTS

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Glass C. & R. Foster. 1978. Two new Varieties of *Gymnocactus* from Northern Mexico. Cact. Succ. J. (U.S.A.) 50:281-285.

BOOKS RECEIVED

Inventory of Rare and Endangered Vascular Plants of California, Fifth Edition. Mark W. Skinner & Bruce M. Pavlik (eds.). Illustrations by Linda Ann Vorobik and Mark W. Skinner. California Native Plant Society, Special Publication No. 1. California Native Plant Society, 1722 J Street, Suite 17, Sacramento, California 95814. 1994. vi. 338 pp. $22.95 ISBN 0-943460-18-2 (paper); $150.00 ISBN 0-943460-19-0 (electronic).

More than simply a listing of rare plants, this book begins with an introduction to California floristics, with background on endemism and other factors contributing to rarity in the California flora. Additional background information includes summary of efforts to preserve the flora, discussion of policy issues, and descriptions of agency responsibilities. The listing itself includes scientific and common names, rarity codes, locations, habitat, life form, flowering period, and notes. Notes include additional information about the plant and references for more information. In addition to the officially rare and endangered plants, many other species are included that had been considered for listing, but were not listed. In each of these cases, the reason for not listing them is mentioned.

PUBLICATION DATES, VOLUME 79

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79(6)	December 1995	23 August 1996

DISPOSITION OF MANUSCRIPTS, VOLUMES 78 AND 79

Manuscripts listed below include those received after examination by two or more reviewers. A note of appreciation to reviewers is found on page 511 of volume 78 and page 70 of volume 80, with the lists of reviewers. Manuscripts received without review are not considered for publication until review has been completed.

Manuscripts received: 137

Manuscripts accepted without revision: 58

Manuscripts accepted after revision: 64

Manuscripts returned to authors without publication: 7

Manuscripts currently under revision: 8

Manuscripts currently accepted but not yet published: 17

Papers published: 105

Days elapsed from receipt of manuscript to publication (includes only those manuscripts selected for publication): mean = 58; range =15-131

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INDEX TO REVIEWERS, VOLUME 79

The editor expresses his most sincere appreciation to the following individuals. These are persons who have reviewed papers that were submitted for publication in volume 79 of Phytologia. Without the willingness and diligence of these reviewers, the task of the editor would be much more difficult, and the quality of the papers published would be lessened. To each of you, I offer my most sincere thanks.

Michael J. Warnock, Editor

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Phytologia (January 1996) 80(1):71.

INDEX TO AUTHORS, VOLUME 79

Information for Authors

Articles from botanical systematics and ecology, including biographical sketches, critical reviews, and summaries of literature will be considered for publication in PHYTOLOGIA. Manuscripts may be submitted either on computer diskette, or as clean typescript. Diskettes will be returned to authors after action has been taken on the manuscript. Diskettes may be 5.25" or 3.5" and may be written in any IBM or Macintosh compatible format. Typescript manuscripts should be single spaced and will be read into the computer using a scanner. The scanner will read standard type fonts but will not read dot matrix print. Manuscripts submitted in dot matrix print cannot be accepted. Use underscore (not italics) for scientific names. Language of manuscripts may be either English or Spanish. Figures will be reduced to fit within limits of text pages. Therefore, figures should be submitted with internal scales. Legends for figures should be included in figures whenever possible. Each manuscript should have an abstract and key word list. Specimen citations should be consistent throughout the manuscript. Serial titles should be cited with standard abbreviations. References cited only as part of nomenclatural summaries should not appear in Literature Cited. Nomenclatural work should include one paragraph per basionym and must provide proper (as defined by the current *International Code of Botanical Nomenclature*) citation of sources of epithets and combinations.

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